THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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COLLIERY EXPLOSIONS.

IN spite of rules and regulations, improved methods of working, and the greater scientific knowledge of mining, terrible disasters such as that which occurred at the Universal Colliery in South Wales on October 14th evidently cannot be prevented, and the worst feature is that the more recent explosions have been the more prodigal in the sacrifice of human lives. The loss at the Universal Colliery is not as yet definitely known, but there is not a shred of hope that any of the poor fellows still in the mine can be alive. Strenuous efforts were made by the band of heroic rescuers, two of whom willingly sacrificed their lives in their eagerness to save their comrades, and several more have been on the verge of death. All honour to them!

It is, however, estimated that the dead will number over 420, rendering this the greatest calamity that has ever occurred in the British coalfields. This, following so closely upon the Hulton disaster with a toll of 344 lives as recently as December, 1910, and the still more recent explosion at Cadeby, resulting in 87 deaths, amongst them being three of H.M. Inspectors of Mines while directing rescue operations, emphasises the necessity for careful consideration of the whole question. There will be the usual clamouring of the miners' leaders demanding investigations, and, if necessary, more rules and regulations to harass the management and owners, because in their (the leaders') view it is *always* the fault of the managers, and usually because they have set at defiance some Government rule or regulation; which, of course, is mere prejudice.

So far it does not appear that electricity, which has been said to be the cause of other recent explosions—particularly in the cases of West Stanley and Hulton—has been blamed for the Universal disaster. Whatever the cause, however, it is the earnest desire of everyone that this shall be actually ascertained, and both managers and owners will be only too glad to adopt any means without an Act of Parliament to prevent a like calamity. Up to the present, however, beyond the fact that it was a coal-dust explosion, no suggestions have been made as to its origin, and, of course, it is very questionable whether the actual cause will ever be established.

Explosions, however, in themselves are not spontaneous; there must be some spark, fire, or light of sufficient intensity initially to ignite the explosive fire-damp, which usually precedes, and is the cause of, a coal-dust explosion. A "blown-out" shot during blasting will also start a coal-dust explosion, but it is exactly similar in its action to an explosion of fire-damp, so that provided these two dangers can be effectually removed, coal dust, *per se*, is not so dangerous. Some dusts are certainly much more prone to explosive effects than others, but we very much question whether it has been definitely established that coal dust will explode if merely ignited by, say, the flame of a lamp or an electric spark. The presence of even as little as ½ per cent. of gas in the fine-dust-laden air enormously increases

its tendency to explode, as the recent investigations of Dr. Thornton have shown, but it would appear that some *violence* of ignition, such as a minor explosion, is necessary to establish a coal-dust explosion.

Therefore, assuming that the ignition of gas and "blown-out" shots could be prevented, it would appear that these disastrous explosions would become very rare. It is practically impossible in the working of a very fiery mine absolutely to ensure that the gas given off shall always be sufficiently diluted with air to render it harmless, as the amount of air in circulation is a more or less limited quantity, but the gas is an unknown quantity, and a sudden "blower" may upset all the calculations of the most expert mining engineer; and it is for this reason that the stringent rule relating to the withdrawal of workmen in the presence of gas is enforced.

To guard against the ignition of gas, the use of safety lamps is enforced, and under the new Coal Mines Regulation Act, only those lamps which have been tested and approved by the Home Office may be used. But though they are tested and approved, and further examined and locked before being given into the hands of the workman, there is still the element of danger known as the "human factor" which is always present. And this, in our opinion, is the greatest of all, and the most difficult to deal with. With regard to shot firing, this is a danger purely dependent upon the care and judgment of the workman. It is entirely in his hands, but so unreliable has he become, that in many fiery mines the management have—at great cost—dispensed with it entirely. The danger lies in overcharging with explosive the shot holes, not putting in a sufficiency of stemming, or not using proper material for stemming. Hence we see that the two chief causes of explosions are mainly in the hands of the workmen themselves, and very much depends upon their own *carefulness* and the exercise of a little common-sense judgment. One of the recent new rules relates to a search of workmen before descending the mine, and Mr. Walker, in his report for 1912, says:—"The result of these searches has been to find a number of the men with prohibited articles in their possession. . . . The fact that more than one of the mines was fiery is disquieting, and shows that a daily search is necessary, and should be carefully carried out." In addition to this, 10 workmen were prosecuted for contraventions of provisions about safety lamps; 14 about matches and smoking, and 27 for breaking rules relating to explosives. Even in South Wales, the scene of this terrible calamity, the chief inspector (Dr. Atkinson) in his report gives a list of 51 prosecutions of workmen by the owners for contraventions of provisions about safety lamps; no fewer than 89 *about matches and smoking*, and 10 about explosives. Similar lists are given in all the other inspectors' reports, and although many of the offences were probably due to inadvertence, we are afraid that in the main they are the result of wilful carelessness, and a lack of respect for all laws, and most of all a want of interest in their employment. Here is the great opportunity for the miners' leaders, and they would do a vast amount of good if, instead of clamouring for the moon and raising dissension between employers and employed, they would first teach their followers their duty to their fellows, and generally set their own house in order before attacking others.

As regards the fear that the use of electricity may lead to the ignition of gas, this is entirely unfounded. That the breakdown of any part of an electrical installation should cause a fire has been proved in practice to be impossible when the plant is properly installed and maintained. It has now been proved by recent tests made by the U.S. Bureau of Mines, that it is *impossible to ignite gas* by sparks obtained when breaking the circuit of a glowing filament in a *portable electric lamp*. Here then seems to be the solution of the lamp problem. The glowing filament possibly would ignite gas, but such a condition would only occur when a blow was, say, just sufficient to break the guard, the thick protecting glass, and finally the thin glass bulb itself, leaving the very delicate filament untouched and unharmed. Such a condition may be theoretically possible, but practically would be impossible to obtain. However, to allow for such a remote contingency, all that it is necessary to do is to design the mounting of the lamp bulb so that a blow sufficient to break the bulb will short circuit or open the electric circuit of the lamp. Even with electricity for power transmission purposes Dr. Thornton has shown that it is extremely difficult with a voltage up to about 200 to ignite a coal-dust-laden atmosphere, even when 2 per cent. of gas is present.

We have constantly advocated the use of low voltages underground generally on the score of safety from shock to workmen, and less difficulty with insulation, and have always been inclined to the opinion that taking 2,000 and 3,000 volts direct to underground machinery was a risky and unwise proceeding. The idea, of course, was economy in cables, but it is much better to study ease and low cost of maintenance, with a much lessened risk of breakdown or danger to workmen, than a low initial cost. This fact is now being recognised, and coal-cutting machines are being installed to work with a pressure of only 220 volts. Hence we come to the conclusion that an intelligent application of electricity for power transmission and lighting, the use of electric safety lamps in place of oil lamps, and strict discipline with regard to rules relating to matches, smoking, and explosives, would do much to make a fiery coal mine, so far as the danger of an explosion is concerned, one of the best and safest places in which a workman could be employed.

The Future of Electricity Supply.

With the fall of the leaf the Institution of Electrical Engineers awakens from its æstivation to renewed activity; the first signs of motion are manifested in the Local Sections, and copies of the inaugural addresses of the chairmen have already begun to flow in.

The first of these was delivered at Newcastle last week by Mr. Charles Vernier, and we have found it so interesting that we have thought it well to abstract it at considerable length. We hardly need say that the author has had unique opportunities on the North-East Coast of acquiring experience in the distribution of electricity on the largest scale as yet attained in this country, and his views on this subject therefore possess exceptional weight.

There can be no doubt that the remarkable development of municipal electricity supply in this country, involving the erection of numerous generating stations of small capacity and supplying absurdly restricted areas, has had a highly detrimental effect upon the progress of the electrical industry within our borders; not only has the price of electrical energy necessarily been maintained at a much higher level than would have been the case if the supply had been derived from large undertakings, thus hindering the general adoption of electricity for domestic and industrial applications, and restricting the market for electrical apparatus, but also our manufacturers have been deprived of

the opportunities enjoyed by their foreign competitors of developing their designs on the grand scale, and thus equipping themselves with the experience necessary to enable them to secure a fair share of the huge undertakings which have been and are being carried out abroad—even in our own Colonial possessions.

The keynote of the whole course of events is *waste*; waste of effort, waste of opportunity, waste of capital; waste of heat and fuel, and not least important, waste of *time*—for modern conditions of industry render the competition between nations a continual race, in which the swiftest gains the prize.

Once again we are led to express our admiration of the epoch-making address in which Dr. Ferranti, with a prophetic vision reaching far into the future, and a breadth of view in striking contrast with the parochial tendencies of the age, laid bare the radical defects of our existing system, and pointed out the direction along which we must advance in order to derive the utmost benefit from our national resources. Mr. Vernier recalls the ideal thus set up, and declares that the first step towards its realisation must inevitably be the centralisation of generating plant, whether entirely in the hands of private companies or with the co-operation of local authorities being immaterial. No time should be lost in disseminating this doctrine, for the electrification of our main-line railways is undoubtedly on the horizon, and unless the chance of providing for their demands is seized beforehand, the railway companies will be compelled to build new generating stations, and a priceless opportunity of retrieving our past errors will be lost. There is no fundamental reason why our municipal authorities should stand aside in "splendid isolation"; once they are led to realise the facts, their commercial instincts will surely enable them to take part in the reorganisation of electricity supply throughout the country, with the certainty that the result will be to the advantage of the communities which they represent.

On the subject of mains, Mr. Vernier is naturally very much at home. We are glad to note his remarks regarding the present attitude of the Board of Trade towards overhead cables, the use of which is absolutely indispensable to the universal development of electricity supply, and we are at one with him regarding the desirability of compulsory powers to enable the opposition of landowners, and even of local authorities, to be overruled.

In conclusion, we cannot but regret that custom forbids the discussion of the chairman's address in open meeting, for we feel that such a discussion on Mr. Vernier's masterly address would be of great benefit to the industry. Is it not possible to remedy this drawback? At least, the widest publicity should be gained for its essential features.

Copper.

Conditions in the copper market continue as strong as ever, and the sole restraining influences upon the upward course of prices are the tightness of money and the pessimism born of adverse reports as to the progress of general trade in all parts of the world. There has within the past few days been a very serious tightening up in the price of cash and near dates, which reveals the scarcity of metal, and it is much to be feared that this unwelcome feature will persist for a rather long time, in spite of any efforts which may be made to relieve the position, for the scarcity of actual copper grows almost daily more pronounced, and it is certain that there will be a further depletion in the world's visible supply at the end of the month. The premium on cash and early prompts is not only having the effect of shaking further the not very robust confidence entertained as to the position, but it also tends to check fresh buying on the part of consumers. These are moderately supplied for their near requirements, but have fair quantities to purchase for future needs, say, over December and onwards. Where copper in anything but retail quantities is to be got hold of in the event of any notable extension of demands, is not at all clear. Certainly it is not to be found in England, and equally the stocks on the Continent are very small, while the returns published from month to month across the Atlantic show the steady process of depletion which has been in progress, and which has brought the reserves down to a record low level. It is the general anticipation that the next statement will show a fresh diminution in the quantity held by American refineries, but the market has lately taken the successive reductions very philosophically, and from the point of view of the price ruling, nobody would imagine that the copper market stood in a more perilous position as regards supplies than at any time on record. The strikes at Lake Superior mines are still in full blast, and it seems quite hopeless to expect any resumption of operations on a normal scale at the Lake smelters for the rest of this year. In any event, therefore, the production of Lake copper this year should show a shortage compared with last year of some 40,000 tons, while to add to the difficulties of the market, the entire Rio Tinto concern in Spain is closed, also as the result of labour troubles. This involves a shut-down in production in Europe of about 2,500 tons a month. The recurring labour troubles in the United States have hit the refineries hard, and in order to keep plant occupied the leading refiners have been compelled to have recourse to Europe, where they have been busy buying up the whole of the available material for shipment to New York for refining. In this way practically all the Chile bars here have been swept up for America, while the process of acquisition has actually been extended to copper which refiners have not hitherto been willing to look at on account of what was regarded as its unsuitable quality. This is now being entirely overlooked, however, so keen is the scramble for metal to keep plants busy. Last week the Amalgamated Copper Co. shipped several hundred tons of Chile bars from Liverpool for New York, and is this week transferring about 1,000 tons of rough English material to the same place. At the present rate of withdrawals, it will not be long before the entire English stock of material in warehouses has disappeared. The fact that speculation is almost totally at a standstill is a very good thing for the market, otherwise there is no telling at what level prices might not have stood. As it is, prices are quite high enough for the comfort of the consumer; and any material elevation of the present level would be bound to react prejudicially upon demands. At the moment, there is plenty of occupation in the copper-consuming industries, the wire and electrical trades generally being especially bright spots.

The New Tungsten Lamps.

Two papers recently read before the American Institute of Electrical Engineers, by Messrs. Langmuir and Orange, on the development of the nitrogen-filled tungsten lamps were of exceptional interest; we commence an abstract of them elsewhere in this issue.

It is now clearly established, as the result of a brilliant research, that the main causes of the blackening of the tungsten lamp are two—direct evaporation from the filament, and transfer of metal by the agency of water vapour, the material ultimately deposited on the glass being in either case metallic tungsten. The method adopted for preventing the discoloration, which is the chief factor in shortening the useful life of the lamp—viz., filling the bulb with nitrogen at atmospheric pressure—is one which, at first sight, appears to offer little chance of success, more especially in view of the remarkable cooling property that hydrogen was found to possess at high temperatures; nitrogen, however, behaves in a very different manner, and appears to afford a satisfactory solution of the problem in the case of comparatively thick filaments.

Unfortunately the rate of loss of heat by convection from small filaments is relatively so much greater that the prospect of achieving equal success with small lamps appears at present to be rather remote.

We note that the intrinsic brilliance of the filaments at an efficiency of two candles per watt is five to eight times as great as that of the one-watt filament; this, no doubt, will be a useful property in some applications, but not in the lighting of streets or interiors, for which the unshielded glare of the filament is already in excess, and therefore it will be necessary to sacrifice some of the gain by using diffusing screens. But there is no room for doubt that for high candle-powers the new lamp will come into use directly it is put on the market.

The Case of Driver Caudle.

Early last week Samuel Caudle, who, as our readers will not have forgotten, drove the second train involved in the Aisgill disaster past the Mallerstang signals, which were set against him, was found guilty of manslaughter, and sentenced to two months' imprisonment in the second division. We understand that there may be an appeal, and consequently the matter must still, to some extent, be regarded as *sub judice*, but there are several comments which occur to us, and which may, we think, be lawfully made at this stage.

From the point of view of the ordinary travelling citizen, the whole case, from the incidents immediately preceding the catastrophe, down to the latest development, is to the last degree unsatisfactory. The engine of the first train was overloaded, coal was bad, and a second engine could not be obtained; the engine of the second train needed lubrication while in motion, coal again was bad, the engine-driver was not at his post, and the train passed signals at danger. Then, owing largely to the presence of gas on the train, several persons were burned to death, and inquests were held. In the first, held on ordinary people, the Coroner's jury found emphatically against manslaughter. Later, another jury, considering the death of Sir Arthur Douglas, found a verdict of manslaughter against the driver, and this verdict has now been confirmed. Another jury, which wanted to blame important officials, had to bring in four verdicts before it could please the Coroner.

We are thus confronted with the fact that, if Sir Arthur Douglas had not succumbed to his terrible injuries, the man immediately responsible would have escaped all punishment—would never, in fact, have been brought to trial. It is apparently necessary for a titled and influential gentleman to die before justice can be set in motion.

There can be no possible question that Caudle's first duty was to look out for signals: for if it could be taken as a matter of course that all trains always ran true to time, signals would be unnecessary. In railway work, as in other things, it is the unexpected that must be provided against. That being so, Caudle was to blame, and deserved some punishment; though we are not inclined to think, as does the Judge, that he has been too leniently treated. There are others who should have been punished first, and severely.

But the cause which chiefly contributed to the awful nature of the consequences of the collision was certainly the gas carried on the wrecked carriages. Now, we suppose all railways are anxious to keep down expenses; and as the great expresses of the North-Western, Great Central, South-Western, Brighton and other lines are more often than not electrically lighted, we have *prima facie* ground for believing that the extra expense, if any, involved is not such as to influence the dividends. The Midland itself generally uses electricity in the dining cars, while the ordinary coaches of the same train are illuminated by gas. The lay Press, of course, got "expert" opinion on this matter at a very early stage, and one gentleman announced, in quite the most approved *ex cathedra* manner, that the power taken by the dynamos reduced the speed of the train. Any ordinary individual who knows an electric lamp when he sees it can calculate for himself that a 15-coach train can be lighted electrically with well under 10 H.P. Add another 20 if cooking is done electrically, and we are not asking a great deal of the locomotive, even in the worst circumstances.

The evidence of the Midland officials, from Sir Guy Granet downwards, absolutely out-Heroded Herod. They talked gas more strongly than gas engineers themselves would have done. We are almost persuaded that the fire would have been far worse without the gas; that the gas, in fact, acted rather as an extinguisher than as food for the flames. We ought to inquire very carefully into the reason for this attitude, which is not novel or unfamiliar on the part of the Midland staff. And who bought the bad coal?

The ideal solution would be the complete electrification of all railways, and we hope that the Railway Commission just recently appointed will be able to hear evidence on this matter. In the meantime, however, the use of electricity for lighting and cooking on trains, and of electrical signals, actuating an audible device on the engine, should be made compulsory, and that immediately.

CANADIAN ELECTRICAL TRADE.

[COMMUNICATED.]

From notices and articles which have recently appeared in the technical Press, it would appear that the relatively small value of British-made electrical fittings imported into Canada is attributed in a large measure to the regulations of the National Boards of Underwriters.

As there is some danger that the effect of these rules is being very much magnified, to the detriment of the British manufacturer, and the benefit of the American, it is the writers' object to show that although these regulations undoubtedly have some bearing on the question, they are not the main cause.

Let us suppose that the National Code is done away with, and that there are no Underwriters' Laboratories or inspectors, will the situation from the British manufacturers' point of view be materially altered for the better?

Take the case of electric cable for house wiring. The Canadian has found that a type of cable chiefly manufactured in the United States is mechanically and electrically quite suitable for his requirements. This cable may not be from a theoretical point of view equal in quality to that manufactured in Great Britain; still it does what he wants, stands the rough usage well and, above all, is cheap. By using this he can materially reduce his total cable bill per annum, or the capital outlay on any particular job, which, in a country that is developing rapidly, is of vital importance.

At the present time the British cable manufacturer cannot produce this cable, and the higher grade cable which he says he makes, is hopelessly out of it in price. Some makers even go as far as to say that they would not produce such a low grade material. If the manufacturer does not make what is required, how can he expect to export it?

It is interesting to note what the effect of the much-abused National Code regulations is in this case. Their specification is very detailed; it gives clearly the minimum physical and chemical properties which will be accepted; samples of all cables have to be submitted to the Underwriters' Laboratories, and the bulk is subject to their inspection. The consequence is the required quality is rigidly maintained and price-cutting by different manufacturers, due to the use of inferior materials in unsuitable proportions, is prevented.

When we remember that the purchaser is usually quite ignorant of the properties of cables, it certainly seems that the existence of the National Code regulations is an advantage to both manufacturer and consumer. They obviously prevent rubbish being sold as cable which could only bring all the manufacturers into disrepute, to the temporary material advantage of the few, to say nothing of the effect on fire insurance premiums generally.

Again, take the case of electric conduit. In large Canadian towns most of the buildings are of the skeleton structural steel type filled in with concrete; in the smaller towns the houses are of the framed wood type. In the former case, the conditions of building are very severe, the labour is unskilled, and everything is subject to very rough usage. The consequence is that it has been found desirable to use conduit of a heavier gauge than that used in this country, where buildings are substantial and high-class labour is cheap.

Exactly the same conditions prevail in the United States as in Canada; the former country has for years been manufacturing a suitable conduit in enormous quantities; the American manufacturer is able to produce it at low cost, and, therefore, to sell it at prices for the same weight per foot run which our manufacturers cannot at present touch. So that here again the ability to obtain our share of the imports depends upon our manufacturers producing the right article at the right price.

There is not the slightest doubt that once the British manufacturer realises the enormous market in the above articles alone, he will set about making exactly what is required, and will then compete.

Another interesting case is that of the small switch for house use. In Great Britain we use the "Tumbler" type;

in the United States they chiefly use the push-button snap type, and Canada has followed suit. Whether in this case the National Code regulations have had a material bearing or not, it is difficult to say. As is well known, their regulations state that switches for this purpose must make and break circuit with a quick action, and must not stop when motion has once been imparted by the handle; in other words, they must be of the quick "make" and "break" type. The ordinary type of tumbler switch does not comply with this requirement, and for this reason was, we believe, rejected in Canada on one or two occasions some time ago. On the other hand, we know that the Underwriters' Laboratories now regard the tumbler switch with no unfavourable eye, and although up to the present it has not been officially recognised in the Code, they have accepted it when specially asked to do so, so that it cannot be said that the tumbler switch is debarred by the Underwriters. It must, however be remembered that to a considerable extent the demand in Canada hitherto has been for flush types of switches for room use, and that here again the price of the flush push-button snap switch of American manufacture is cheaper than the flush pattern tumbler.

As regards small double-pole knife switches for house service use, the price for these in Canada is so exceedingly low that the British manufacturer practically declines to make them even in large quantities. The National Code has, therefore, no effect whatever on the British exports of this article.

The above instances, we think, show that the real reason why the British exports to Canada of these articles is so low is that the British manufacturer has not yet realised that the demand in Canada is for a type of article different from that being made at home, and that if he wants a share of Canada's business he must make what the Canadian requires, and not merely try to sell him what he makes.

When the British manufacturer realises this and sets seriously to work to compete, the existence of the National Code will be, in our opinion, a positive advantage. It clearly sets forth what is required, the rigid inspection compels the maintenance of the quality, and given a settled type, no country can produce a good article at less cost than Great Britain. So that eventually her competition will be severe, and she will secure her proportion of their trade. It appears to the writers that this aspect of the case has been overlooked.

The British manufacturer will probably reply that this may be all right, but he cannot compete in price until he is manufacturing in large quantities, that is, until he can get the orders, whereas, if his usual standards were accepted by the underwriters, he could compete now and increase his outputs in them. The cases cited above of cables, conduit, and flush and knife switches, entirely disprove this.

There is also a further point to be considered. The requirements of the National Code, and the types of apparatus supplied in accordance therewith, are well known in Canada. The factor and retailer knows that switches, cable, &c., which have been passed by the Underwriters' Laboratories have certain well-defined qualities which appeal to the consumer, and therefore he has confidence in carrying a stock of them; and the consumer knows that in purchasing apparatus which is approved by this body he is getting an article which is suitable for his purpose. In a sense he has come to look upon the Underwriters' label as a guarantee. This does not necessarily mean that British types are inferior; but it does mean that if we are going to get British types accepted, our manufacturers will have to start an expensive campaign to prove to the consumer that our types are superior to those now commonly sold, and after they have convinced him on this point, they will have to show that they are so superior that he should pay a great deal more for them.

Again, we must remember that, owing in a great measure to the National Code, the Americans have standardised most commonly-used fittings—such as knife switches, snap switches and clusters—to such an extent that those supplied by different makers are practically interchangeable. Can this be said of British knife switches, ceiling roses, tumbler switches, &c.? We hardly think so. The lack of standardisation forms a very serious obstacle to the use of British fittings in a large country like Canada, which is sparsely populated, and where the volume of business in numerous small towns does not warrant the retailer holding stocks of all makes and sizes.

Does it not, therefore, appear that the only way to increase our exports to Canada in small electrical fittings is to accept the situation as it stands, and make apparatus exactly similar to that in use out there; have it approved by the Underwriters' Laboratories, which can now be done in Great Britain by British engineers; reorganise our selling arrangements out there; and obtain our share of the trade by showing that we can supply exactly what the customer requires, at the right price?

Let the British manufacturer also remember that the United States have just effected a reduction of their import tariffs; this means that they are going to invite competition by foreign manufacturers. If we are to obtain our share in that market, we shall have to make the types required, which are the same as those for Canada. So that in developing the types for the Canadian market, the manufacturer will be putting himself in a position to compete in the United States market in due course.

LEANING BUILDINGS AND THEIR STRAIGHTENING.

In the case of a chimney which leaned considerably to one side owing to prevalence of wet weather during building, it was desired to straighten it. The inclination was not from the foundation, but was more in the nature of a curvature of the shaft, chiefly in its lower part where the soft mortar was compressed on the weather side because of the building being carried out too quickly for the mortar to dry sufficiently to carry the load. This manner of shrinking is not likely to take place to-day, because cement or gauged mortar should be used under such conditions. It is hardly possible to carry up a building in cement mortar so quickly that the weight increases as rapidly as the sustaining capacity of cement mortar.

In the case of the chimney above referred to, ropes were attached to the chimney at a high point, and so much tension placed upon them as would hold the chimney whilst a

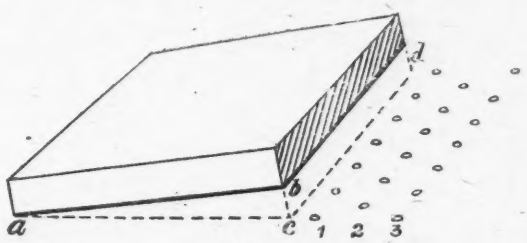

Fig. 1.

narrow wedge was cut out of it, the gap being well mortared over the cut surface, and the chimney allowed slowly to come over upon this mortar. Well carried out, this leaves very little sign, and is effective in bringing back the centre of gravity of the chimney near, or nearer, to the middle of the base.

But a chimney may lean because one side of the foundation yields too much. Such a case would be represented by fig. 1, wherein the square foundation block takes a slope, and requires a flat wedge of earth to be removed from beneath it—namely, $a\,b\,c\,d$. To set such a foundation level, the volume of this wedge must first be calculated. This will be one-half of the product of $(a\,c \times c\,d) \times b\,c$.

Alongside the high side of the foundation, a row of holes No. 1 should be bored to a depth of 20 or 30 ft., if the earth is of a yielding nature to this depth. The first hole should be at the middle of the high side, and the others should be placed at the extremities of the line $c\,d$, then half way between the holes already bored. The end holes should be placed a little further apart than the length of the block. The first row of holes may remove a volume of earth whose bulk

must be calculated only below the level of the base or *a c*. Thus, suppose the base is 30 ft. sq., and the height *b c* is 3 in., the volume of the wedge *a b c d* will be 30 × 30 × 0·25/2 = 112 cb. ft. Then 11 bored holes of 6 in. diameter carried 28 ft. below the line *a c* would remove approximately 62 cb. ft. This might be too drastic for a first trial. It would be better to try, say, 4-in. holes, and remove about 28 cb. ft. from below the *a c* level. Theoretically, this should so remove lateral support from the earth under the block, that the foundation would come down $\frac{3}{4}$ in. or $\frac{28}{112}$ of the wedge volume. This would be a matter for observation.

The yield of the bored holes would be tested by means of rods. If very slow, as in dry hard clay, a little water filling would help them to crush in. Then a second line of boreholes, 2, would be put down opposite the spaces between the first set of borings. The amount of settlement would again be watched, and when complete, the amount of subsidence noted and the third line of holes undertaken—perhaps of only 3 in. diameter if the shaft was getting near the perpendicular. Some little lean might still remain with advantage, for settlement would probably continue for a time and too much should not be done, the mass removed not being so much as the wedge volume. If the upper parts of the holes do not cave in, they should be filled up. Or the holes may even be cased down as far as the line *a c*, and after the first removal and caving in, the holes may be rebored until the wish-for result is obtained.

The object of making the bored holes is, of course, to remove the lateral support from the cube of earth below the foundation block. This mass of earth cannot stand without this lateral solidity; it slowly crumples up, and continues to yield until it has crushed all the holes solid, when no further yield is possible until another boring again takes away support and allows further crumbling of the earth below the block.

Such work must be done slowly and with caution, so that the movement may be slow and steady, and the settlement must be watched and controlled so that one corner does not sink faster than another. Should this occur, the next row of holes must be spaced so as to adjust matters.

It is desirable or preferable, on general principles, that the the holes should be cased, if only with stove-piping, down to the foundation level, and after the caving-in of the unlined lower portion the casing should be filled up or removed as the filling is put in.

The system is scarcely applicable except to foundations of comparatively small area which will move as a single piece. It would be applicable, possibly, with care, to the case of the four supporting piers of the dome of St. Paul's considered alone, but the attachment of the superstructure to other portions of the general structure precludes such treatment, for it would be impracticable to carry out such a process upon a number of separate footings entirely disconnected except by the same superstructure, which would be badly shaken as a result.

CONSUMERS' HIRE ACCOUNTS.

By "INTERESTED."

Municipal electricity supply undertakings are hedged about with much legal growth, the usefulness of which is more or less open to criticism. One of the numerous statutory requirements is that where electrical apparatus is hired to consumers, the demand note or invoice must clearly show the sum charged for hire or rental of the apparatus as distinct from the charge for energy consumed. Under certain circumstances, this inflexible rule tends to make the consumer's accounts unintelligible to one who neither knows nor cares for the so-termed "red tape" reflected in the figures on his invoice.

In some instances it is possible to present a demand note for payment to a customer in a lucid form, but in others quite the reverse is the case. Take, for example, a Council which has in operation a scheme for hiring arc lamps to consumers on the basis of so much per annum for a guaranteed number of hours' use, including the supply of carbons, trimming, cleaning, &c., any excess being charged for at a predetermined rate set out on the application form. A simple manner of rendering accounts, and one which many consumers would perhaps prefer, is merely to invoice each quarter one-fourth of the agreed annual charge, adding to the fourth quarter's account any extra charge due where the total hours the lamps have been alight exceed the agreed guaranteed minimum. However, the law says this will not do, and stipulates for separate items showing hire or rental and likewise energy consumed; and in order to comply with this request, it is necessary to charge upon the actual length of time the lamps are used each quarter.

Of course, it is not a diplomatic move to explain to a prospective customer just how and in what form his accounts will be rendered. The result is that upon receipt of his first demand note the consumer is puzzled to know why the charge is not merely one quarter of the annual sum agreed upon. To devise a form in which to render the accounts so as to show clearly how the charge is made up, and to save repeated inquiries, is rather difficult at first sight. One method of doing this is as follows (see Card No. 1):—

Card No. 1.

ARC LAMPS ON HIRE.

Address..... Application No.....
No. of Arc Lamps..... .... Name.....
Guaranteed hours' use per annum ..... Cost.....
for £ .....

Date.	Hour meters.				Units used.		Arc lamp rental.	Total rental.	Remarks.
	No. 1 reading.	No. 2 reading	No. 1 advance.	No. 2 advance.	Units at 3d.	£ s. d	£ s. d.	£ s. d	

No. 1 card or book, whichever is preferred, is intended for use at the electricity works, and at the top are recorded particulars of the chief points in the agreement. Below are columns for readings of the hour meters, which record the number of hours the arc lamps have been used, the quantity of energy consumed, the cost of the energy, and also the charge for hire.

The method of working out the charges will, I think, be clearly seen from the figures shown. (See Card No. 2.)

Card No. 2.

Town Hall, London.
.....19.....

M .....
.....

Dr. to

Quarter ending June, 1913.	Arc Lamp Hire s/s. (one pair) Minimum guarantee, 800 hours p.a. Annual charge, £14 Used during quarter, 380 hours = $\frac{380}{800}$ of £14 =	£6 13 0
	Extras:	
	.....	
	Analysis: Energy consumed: 266 units at 3d. = £3 6 6 Balance being hire charge:— £3 6 6	
		£6 13 0

No. 2 is the suggested form of invoice for sending to the consumer. The details shown afford the consumer every opportunity of seeing how the charges are arrived at, and likewise point out that the sum fluctuates according to the length of the time the lamps are used.

It is worth a little trouble to explain matters to consumers, for it must also be remembered that he views his account from the aspect of a purchaser, and cares nothing for the enforced red-tape methods of the supply department. After all, extensions come from those consumers who are not given the chance to complain.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Travelling Representative.

One is sometimes tempted to question the usefulness of the enormous army of travelling representatives maintained by manufacturing firms in this country whereby the cost of the products must necessarily be substantially increased. The custom of sending out travellers with samples arose long before the electrical industry came into being, and at a time when no other means existed of bringing new products to the notice of possible buyers. In these days of Press notices and frequent exhibitions the need for personal calls is not nearly so great, yet owing to competition we have an actual increase in the proportional number of representatives travelling about the country whose expenses have to be paid by the consumer in the form of higher prices.

The effect of personal visits varies with the knowledge of the prospective purchaser and the nature of the product for which it is attempted to obtain orders.

The technical Press is willing enough to give descriptions of any apparatus in which novel and advantageous features are to be found, hence both consulting engineers and contractors are *au fait* with what is on the market in their particular lines. Moreover, orders from these sources are seldom given without obtaining prices from a number of different firms, consequently the only result of a call—if, indeed, an interview be granted—is to keep the name of the firm in mind when inquiries are being sent out. Amongst consulting engineers must be included engineers-in-charge to large industrial or municipal undertakings, who, in up-to-date knowledge, are generally equal to their independent brethren.

Time and money spent upon looking up contractors and engineers is therefore practically wasted excepting for the purpose of keeping them reminded of a firm's existence, but this object can be equally well effected by sending out periodical circulars and by advertising in journals of repute. We refer here more particularly to the calls of ordinary representatives. Where the principal or managing director of a manufacturing firm, perhaps himself an engineer, makes a round of old customers, the effect is often very useful. Again, the ordinary traveller seldom possesses more than a smattering of technical knowledge, and engineers rather resent calls from representatives of this type.

The smaller consumer who is very often ignorant of prices and the comparative merits attaching to various makes of article or machine he may require, can sometimes be approached by travelling representatives with success, but more often than not he will send out to a number of firms for competitive prices and place his small order with the lowest tenderer. In any case business of this description takes a lot of getting, and prices are generally cut pretty fine, so that by the time travelling expenses have been covered very little profit remains.

The only legitimate field for a travelling representative in connection with electrical machinery and apparatus is the explaining of new complex products, of which the advantages cannot be clearly set forth on paper. A good technical man is required for work of this nature, and he must be well up in the products offered by competing firms while being enthusiastic over the advantages of his own.

If travelling for orders were confined to this field, and the annual rounds of old customers by principals or managing directors, as mentioned above, the whole electrical industry would benefit from the increased trade promoted by lower prices.

Anti-Traveller.

Remarkable Motor Records.

The writer of the letter under the above heading, in the issue for October 24th, evidently assumes that the article published on October 10th was written by the designer of the machines referred to; in this he is mistaken.

I notice that he imports into his letter a figure, viz., 160 B.H.P., which nowhere appears in the notice of the 10th.

The writer of that notice claims nothing, he simply states facts. The machines were designed to do 120 B.H.P. at 650 R.P.M., and they have been running under these conditions with the most perfect satisfaction for the past four or five years.

Your correspondent's remarks as to temperature and time taken to reach the maximum rise apply to ordinary type machines, but these are not ordinary type machines, and the same rules do not apply to them. They reach their maximum rise after running for three hours.

This is purely a matter of design. I have built machines which, running on constant load, reached their maximum temperature after two hours, showing no further rise whatever, although kept running on the same load for six hours.

Your corresponent speaks of "the nature of the design," while he is totally unacquainted with the design he presumes to criticise, and so far from his assumptions in regard to the losses being anywhere near the mark, I may assure him that when these machines are putting out 120 B.H.P. at 650 R.P.M., the total losses do not amount to the 7 per cent. he apportions to the armature C^2R and iron losses, and no matter how long they may continue to run under these conditions, the temperature of no part would approach anywhere near the ordinary limits.

In regard to commutation and the state of the commutator, I would recommend your correspondent to read the notice of October 10th over again, and with a little more care than he appears to have bestowed upon it formerly.

In conclusion, I would say it is just because designers have so long travelled what they consider a well-defined road that they find it so hard to deviate from the beaten track, and thus do not know how to get the maximum result from a given amount of material.

I shall be pleased to furnish test-sheets or test-curves, if the Editors will allow space for their publication.

Henry Chitty.

London, N., *October 28th*, 1913.

Electric Cooking for the Smaller Consumer.

I was much interested in the communicated article on this subject in your issue of October 17th. The solution of the problem of introducing electric cooking to the smaller consumer is not an easy one, and, as usual with central-station officials, the writer of the article blames the manufacturer of the apparatus for his lack of enterprise in helping the solution; the manufacturer in his turn does not hesitate to blame the central-station officials for their general apathy upon the subject. Some day, perhaps, they may cease to waste their energies in this manner and combine their talking and writing abilities in a campaign on the consumer, in something approaching the American manner. I fancy the results might be happier for both.

It might be well for the central-station engineers and other self-constituted critics of the manufacturer to bear in mind that in all electrical apparatus, and more especially in electric cooking apparatus, where the demand is very fluid and has not yet crystallised into any very definite form, thanks partly to the diverse views held by station engineers themselves, the manufacturer is compelled to feel his way cautiously along the margin of effective demand. Just now that demand, caused by the ignorance of the public of first principles, is for an electric cooker which looks and works as nearly as possible like a gas cooker, and for an electric hot plate which looks and works like a gas ring, neither of which articles can be regarded as really efficient. Central-station engineers and their assistants could help a great deal, if they would, to educate the public, and so create a demand for apparatus, the design of which should in every way be the outcome of the problem to be solved, not a mere imitation of articles with quite other origins. There is at present on the market an oven so designed. It is made in

two sizes; the small size will take joints up to 7 lb., and is loaded to 600 watts; the large size will take up to a 14-lb. joint and is loaded to 1,200 watts; both are fitted with heat regulation. Either size will attain cooking temperature in six minutes, and, further, by a simple and ingenious device, there is practically no loss of heat on opening the oven door, thus avoiding one of the greatest losses in electric cooking. In a test recently taken in our kitchen, a 6-lb. joint of beef was cooked, and cooked well, with a consumption of 1 unit. If the writer of the article in question, or any other station engineer, is sufficiently interested in efficiency, my firm would be happy to send descriptive matter or to lend an actual sample for test.

Simplex Conduits, Ltd.
T. Birkett, *Manager*,
Heating and Cooking Department.

Birmingham, *October 21st*, 1913.

"Oil."

A London gentleman has called my attention to a review on my book *re* above in last issue Electrical Review.

Probably the enclosures will sufficiently explain themselves.

The writer of the article must have been blind mad with malice when drafting, to put the mildest possible construction on it, it is not fair comment—it is truly scurrilous.

I have no undue desire to take full advantage of the position, if you care to publicly rite the wrong there has been done in public, the matter drops.

Otherwise shall consult my solicitor at the end of seven days, when we will see whether the book or the reviewer is 200 years behind the times, or whether the author or the reviewer has made a hodge-podge of it, then the reviewer will probably learn what lias formations are, and will be actually shown some vegetable limestone in distinction to lias and carbonaceous limestones.

The attack is deliberate, wanton and deplorable, and I'm not the sort of man to take such damnable treatment lying down.

It is remarkable that such a "bit of a book" should command such a lenthy review.

However, the repair must be unmistakable—not half-hearted, as the review was certainly not.

W. Antrobus.

Eccles, *October 25th*, 1913.

[The author of this book wrote us some time ago, asking if we would give it a favourable review; we replied that we were always prepared to review books on their merits, and if he sent us a copy of the book we would give it proper treatment. This we have done. The author's suggestion that our criticism was actuated by malice is ridiculous; it was written by an expert on both oil fuel and geology, and we have personally satisfied ourselves, by an examination of the book, that his comments were just.

Our reviews are not adjusted in length according to the size of a book, nor are they based upon an inspection of the preface and table of contents, as some of the "Press Opinions" sent us by the author appear to have been; and the fact that these "opinions" differ from ours leaves us cold.

We regret that the author's feelings have been hurt; but those who cannot bear criticism should not write books. For the rest, his letter, printed as written, speaks for itself. —Eds. Elec. Rev.]

Faraday House O.S.A.—The annual smoking concert of this Association is to be held on Friday, December 5th, at 7.30 p.m., in the Crown Room of the Holborn Restaurant. The president, Mr. H. T. Harrison, M.I.E.E., will occupy the chair.

Italian Tariff.—The Italian Customs Authorities have lately given a decision to the effect that "air-suction electric ventilators" are dutiable under No. 314A of the Tariff, the duty being 25 lire (about £1) per 100 kg.

LEGAL.

Osram Lamps Works Co., Ltd., *v.* The Ostra Light Co.

In the Chancery Division on Friday, October 24th, this case was mentioned to Mr. Justice Joyce upon a motion by the plaintiffs for an injunction which was mentioned by Mr. Lunge.

Mr. Newbolt, for the defendants, said his clients were anxious to ascertain the facts in this case. These 156 lamps were in Court. All the lamps sold by the defendants bore their mark, and among the 156 none bore the defendants' mark. His clients, therefore could not help thinking there must be some mistake, and as they were indemnified by their vendor, they wanted to have an opportunity of seeing the lamps. It was desired that they should be kept in the custody of the Court. Plaintiffs said defendants had infringed their patent by selling some lamps, but when the defendants looked at the lamps they said these were not the ones they sold.

His Lordship: I suppose the plaintiffs' evidence identifies them by marks.

Mr. Newbolt: It identifies them, but not by marks.

His Lordship: Then it does not identify them.

Mr. Newbolt: It identifies them by exhibiting them.

Mr. Lunge: They are not exhibited at all. They are our private property. They were broken for purposes of analysis, and there are some residues left over, which are in our possession.

His Lordship: I never heard of such a thing as objecting to produce things which you say are an infringement.

Mr. Lunge: There is no objection, except that I don't know of any machinery for detaining the things in the custody of the Court.

His Lordship: I can find machinery, but I don't suppose you would mind lending them to the other side.

Mr. Lunge: Now it is suggested that the identity is in dispute that would be curious.

His Lordship: You must allow the other side to see them, or I shall make no order.

Mr. Lunge: We have offered to let them see the things at any office they can suggest.

Mr. Newbolt: I want to prevent them being changed again. My clients say plaintiffs have got some other infringement without their marks, and I say I can prove that defendants did not sell these.

His Lordship: You don't dispute the patent.

Mr. Newbolt: Not a bit. I am indemnified, but my vendor says I did not sell you these goods, and it is no good talking about indemnity.

His Lordship: You are not going to sell anything you know to be an infringement.

Mr. Newbolt: I am selling for my vendor, who says they are not an infringement.

In the end, the motion stood over for a week, his Lordship remarking that unless the parties could agree on some place for the deposit of the alleged infringements so that defendants could see them, he would order them to be brought into Court.

Osram Lamp Works, Ltd., *v.* London and Provincial Electric Lamp Co.

In the Chancery Division on Tuesday, before Mr. Justice Joyce, Mr. Hunter Gray, on behalf of plaintiffs, moved for judgment against defendants in an action for alleged infringement of the plaintiffs' patent.

Mr. Gray said this was a motion for judgment in default of defence, and remarked that it appeared that the defendant company was being carried on by a lady under her own name.

His Lordship made the order as asked.

Dumbarton Tramway Co. Sued.

In the Court of Session, Edinburgh, Lord Skerrington and a jury tried an action by a general dealer belonging to Renton, against the Dumbarton Burgh and County Tramways Co., Ltd, for £1,000 for personal injuries through being hurled from the top of a float. The contention was that the wheel of the vehicle caught against the side of one of the tram rails, and that at the point where the accident happened, the setts had become sunken. The company denied that the roadway was dangerous. The jury returned a verdict for pursuer, and assessed the damages at £250.

National Electric Construction Co., Ltd., *v.* Redditch Urban District Council.

Last week Judge Amphlett's reserved judgment in this case, which was heard in August, was delivered. Plaintiffs claimed £12 16s. 5d., said to be due under an agreement dated January 3rd, 1899, made between the plaintiffs. The amount was made up of three outstanding free-wiring rentals accrued between June 24th, 1908, and September 30th, 1912, which three customers of the defendants had not paid.

Judge Ingham now announced (according to the *Redditch Indicator*) that judgment was given in favour of the plaintiff company, with costs.

Mr. F. W. Whiteley, on behalf of the Council, pointed out that several vital matters were affected if the judgment held good against the Council. He asked his Honour to grant leave to appeal, with a stay of execution to enable the Council to meet.

Mr. Tunbridge said he did not object to a stay of execution for the usual time, and the application was granted.

INSTITUTION OF ELECTRICAL ENGINEERS.

Newcastle Local Section.

On Monday, last week, the Chairman, Mr. C. Vernier, delivered his inaugural address, of which an abstract is given below:—

Previous to the year 1900, public electricity supplies in this country were, generally speaking, chiefly utilised for lighting. As the result of an investigation in 1898 a Joint Committee of the House of Lords and the House of Commons made certain recommendations, which resulted two years later in the granting of statutory powers to several Undertakings formed for the purpose of supplying electrical energy over very large districts, covering in many cases some hundreds of square miles.

The advantages which have been claimed for these Undertakings, and which are no longer open to question, may be briefly summarised as follows:—

(1) The low capital cost per kilowatt of Generating Stations and the increased economy in running charges obtained by the use of very large generating units.

(2) The development of high load and diversity factors resulting from the varied uses which are made of the electrical energy supplied.

(3) Low fuel costs obtained by the favourable location of Generating Stations and the opportunities afforded for the utilisation of waste heat and other forms of waste fuel.

In general, the higher the price of fuel, or the poorer the load factor, the less a high capital cost can be defended on economical grounds. It may also be stated that in a large scheme, the cheaper the fuel, the more desirable it is to run the plant at a high load factor; therefore, any stations operating with cheap fuel, such as cheap waste coal, heat or water power, must be run as nearly as possible continuously at 100 per cent. load factor, the ordinary coal-fired stations dealing only with the fluctuations of load. This is where the producer of waste heat finds it to his advantage to co-operate with a Power Company.

If we now examine the conditions under which electrical energy is produced in this country, it is clear that, with a few exceptions, we are very far from according with the conditions I have described as essential to a low cost of production.

The multiplicity of small generating stations, some 40 per cent. of which are of a capacity under 1,000 k.w., supplying small districts, inevitably results in high capital charges, poor load factors and high fuel and running costs.

When we note that the use of electricity from public supply sources in that portion of the North-East Coast served by the Power Companies has increased by over 3,200 per cent. within the past ten years* and that, as the result of a cheap and abundant supply of electrical energy, new industries are springing up in our midst, it is surely a matter for regret that similar rapid progress has not taken place to the same extent elsewhere.

Dr. Ferranti, in his inspiring address to this Institution three years ago, set before us an ideal of what electricity supply should be, and it is perhaps pertinent to ask ourselves what we in this country are doing towards the realisation of that ideal.

Do we not see each year existing generating stations of small and moderate size being extended?—Generating stations which in many cases are quite unfitted, by their unfavourable situation, to achieve the economical production of electrical energy.

Then what of our load factors? How very few (less than 3 per cent.) of our electrical undertakings of to-day can exceed even a twenty-five per cent. load factor.

Again, how many of our Undertakings can profitably avail themselves of the utilisation of such waste heat as may exist in their neighbourhood?

The waste heat from coke ovens and blast furnaces in this country, would, if fully utilised, be more than sufficient to operate the whole of our existing public electric supply stations, with a combined maximum load last year of between 700,000 and 800,000 kilowatts.

The first step towards the realisation of Dr. Ferranti's ideal must inevitably be in the direction of the centralisation of all coal-fired generating plants into large power stations supplying in bulk over very large districts, so as to obtain the benefit of large outputs and increased load and diversity factors. These stations will have, as far as possible, to be interconnected together, while all available sources of waste fuel must be fully utilised.

I do not underrate the difficulties which will have to be overcome before this development becomes an accomplished fact, but that we have in this district already proceeded a tolerably long way towards its solution should be evidence that if the problem is approached in the right way, its solution is not to be feared.

What then is the chief obstacle to the centralisation of our electric power supply? Is it not largely the opposition which is almost invariably offered by municipal authorities, and particularly by the more important of them, to the exercise of private enterprise within their borders? It will not be easily forgotten how strenuously the Power Bills were opposed by the municipal authorities, with the result that in most cases the larger towns and industrial centres were entirely excluded from the area of supply, while the supply in bulk within the area of any existing undertakings is usually made subject to their consent. To this fact, coupled to the aversion of many of our Local Authorities to themselves entering into contractual relations with Public Companies for bulk supplies, must be attributed the slow progress which many of the Power schemes have achieved.

It may be argued that the centralisation of power supply is not of necessity a matter to be undertaken by private enterprise, but the jealousy of control between neighbouring authorities appears to be an even greater obstacle than the ones previously mentioned.

While the Electric Lighting Acts afford to Local Authorities the right of combination or to promote joint schemes, similar schemes between a number of Companies or between Local Authorities and Companies are denied, and even the supply from a single generating station of two or more districts scheduled under separate Provisional Orders but operated by a single Company, cannot be carried out without special parliamentary authority; all powers granted to Companies, if we except Power Companies, being subservient to the right of purchase of Company Undertakings by the Local Authority for the district.

Although from time to time we have been assured that the position of our electrical supply industry was in no way behind that of other parts of the world, I question very much whether we can make the same statement to-day, in view of the rapid progress which is taking place in other countries at the present time. If we assume that our electrical supply industry commenced in 1890—although a few undertakings were started earlier than this—at the end of the first 13 years the annual consumption had risen to 247 million units in round figures, while in the next 10 years (1903-1913) this consumption amounted to 1,318 million units (see Garcke's Manual), or an increase of 433 per cent. If the pioneering work of the first-named period is considered, few, I think, and least of all in this district, will be prepared to agree that the increase within the last 10 years represents the rate of progress which we ought to expect. The reason for this is clearly that the great majority of our Undertakings by their operations on the restricted scale created by their condition of municipal isolation, are not in a position to supply the larger users, such as industrial power consumers of all kinds, and railways. Nor is it possible that we shall ever be in such a position, so long as for sentimental or other reaons it is considered essential to retain a power station for each town or district, irrespective of its size or facilities for economical production.

That many of our Undertakings are experiencing the pressing necessity for larger outputs and higher load and diversity factors is evidenced by the special efforts which are being made to develop electric cooking. To those of our undertakings especially whose operations are circumscribed by limitations of the area of supply, this development must be of particular importance, and it is so far fortunate that their inability or unwillingness to improve their position by other possible means has compelled them to break new ground and direct their attention to the energetic development of this business.

Meanwhile, unlike the small power business, which in many places has reached no unsatisfactory proportions, the development of the heavy industrial power supply over a large part of the country appears to be languishing, and yet how much remains to be done may be seen from the last Census of Production, which gives the total horse power, of engines in use at that date (1907) in the factories and mines of this country at 10¼ million horse power, of which 1½ million horse power, or only some 14.3 per cent. represented the total plant capacity of public electric supply undertakings.

More recent complete figures are not available, but some measure of the increase of horse power available in our generating stations can be obtained from Garcke's Manual, which shows an increase of plant capacity between 1907 and 1913 for those public supply undertakings which furnished returns of just over one-half million H.P. or rather less than the average rate of increase since 1890. I have been unable to obtain any figures bearing upon the total horse power of engines in use in the country at the present time, but assuming, for the purpose of comparison, that no alteration in the figures has taken place elsewhere than in our public electricity supply stations, our progress would be represented by an increase during the past five years of four per cent. of the total.

A further surprising fact shown by the last Census of Production is that there was approximately one million horse power in private hands utilised for generatng electrical energy, which produced an output equal to fully 62 per cent. of the entire output of our public electricity supply undertakings. Comment would be superfluous.

The most important development of the not very distant future will undoubtedly be the electrification of our railways. Steam locomotives have about reached the maximum dimensions allowed by the present load gauge, and the demand is

* In that portion of the North-East Coast not served by the Power Companies, which includes many of the large towns, the corresponding increase is under 450 per cent., which is also about the average for the whole country for the same period.

still for heavier loads and more frequent traffic, two problems which electric traction is eminently fitted to solve.

But now as to the supply of electrical energy to work our railways, are we going to repeat the mistakes of the past and add to our already too numerous generating stations by compelling our Railway Companies to put down their own generating stations, as several have done already? This load at any rate is not one which for various reasons our municipalities can ever hope to touch and there is, I think, no better illustration of the shortcomings of the present state of our electric supply industry having regard to its ability to meet all demands.

It is certain that the ability to supply a likely demand will largely create such a demand; and if we wish to see a more rapid development of the electrification of our railways, the electrical supply industry must place itself in a position to supply all the requirements of our Railway Companies at a rate which will induce these Companies to undertake electrical working. It is not to be supposed that our Railway Companies would expend the necessary capital for putting down generating stations of their own if a sufficient, cheap, and, above all, a reliable supply were to be obtained from public supply sources.

It appears to me that here lies the key to the future position of our electric supply industry. There would seem to be but two alternatives, once the electrification of our railways begins in earnest; either, as I have said, our public supply undertakings must then be in a position to undertake the supply of all the requirements of our railway companies, or our railway companies will themselves put down large generating stations, and, at a certain stage of their electrification developments, will inevitably seek to supply other undertakers in bulk. In either case, the compelling agency will be that of larger outputs and the better load and diversity factors to be obtained by co-operation. The balance of advantage should obviously lie with us, who are first in the field.

There is further a vast and practically virgin field in the supply of electrical energy for electro-chemical and electro-thermal processes, which, however, will only be secured at rates which are but a small fraction of the present works costs of the large majority of our undertakings. In this field, so far, a few of the power companies stand practically alone, and chiefly those operating in this district, where, as a result of the electrical facilities offered, a number of important new industries have erected works adjacent to the power stations of these companies.

If our position is now relatively unsatisfactory when compared not only with other leading countries, but especially, and I think this is the more correct view to take, with what it should be, considering our industrial supremacy and the density of our population, it is surely a matter of the first importance that the causes which at present hamper the progress of the industry should be enquired into, and that the best means to remove these disabilities should be once more discussed and formulated in the light of present-day experience. This is a question which the Institution, in pursuance of its broader policy, cannot afford to ignore.

It will be of interest to observe that public electricity supplies in Germany have developed on very similar lines to those of this country, in so far as many of the Local Authorities established their own works. Perhaps in one respect their condition was even worse than ours, for in 1909 it was estimated that 80 per cent. of these Municipal Works were of a capacity under 500 k.w. Germany is at present wrestling with this problem of the centralisation of power generation, which we ourselves must eventually face, and is putting down large stations for supply in bulk, many of them in connection with Iron and Coal Companies, utilising waste heat from coke ovens and unsaleable qualities of fuel.

The co-operation of municipal authorities is being secured in some cases by buying out municipal undertakings upon terms advantageous to both sides, but more usually by giving these municipalities a financial interest in the Power Company. As an instance, the Municipality of Strasburg takes the whole of its supply from a power company supplying also some seventy communes in Alsace-Lorranie and in which it owns a large number of shares. As the result of the operations in 1909, the Municipality received dividends and a share in the profits amounting approximately to £38,000, which, after deducting 4 per cent. interest on its invested capital, left a balance of over £21,000 for the relief of local taxation. In other instances, groups of Urban and Rural Authorities co-operating with a power company have the option of subscribing for ordinary shares in the promoting company, usually up to 40 or 50 per cent. of the total capital, or in some cases, when wishing to avoid risk, to preferential shares with a fixed dividend and a further share in the profits.

In each case, the Municipalities are directly represented on the board. The mutual advantages are obvious; in that the companies enjoy the benefit of the greater facilities afforded for raising capital, while the community, through its directors, maintains a live interest and a share in the control of the undertaking. Such schemes of harmonious co-operation, it must be admitted, cannot fail to hasten the solution of this problem.

It is, perhaps, in the United States of America, however, that the centralisation of electric power production and distribution is making the greatest progress, and it is also remarkable that in that country the supply of electrical energy is chiefly in the hands of private enterprise. We have nothing to compare with the electric service in Chicago, with its maximum load of 230,000 kilowatts (which compares with 20,000 kilowatts ten years ago) or with more Urban supplies, such as the Public Service Corporation of Northern Illinois, supplying 46,000 consumers in 150 communities, whose combined population is only one half million distributed over a tract 150 miles long, and working on a system load factor approaching 70 per cent. This load factor in itself is a striking example of what can be achieved by supplying various demands over very large areas. Another example, out of many which might be quoted, is that of the Central Illinois Public Service Company in the same State, which is gathering into one management and system the electrical requirements of a Rural District of 350 miles radius (larger than the United Kingdom) with a population of only a quarter of a million, whose present 90 local generating stations will shortly be replaced by a small group of modern central stations.

The principle of State regulation of Public Utility Companies, which not only include electric supply, but also gas, water, telephones, telegraphs, tramways, light railways and railway services, is that which finds its adoption in the United States under the description of Public Utility Commissions. These Commissions, which are of recent origin and adoptive for each State, are appointed to deal with all questions relating to public services, such as the ratification of franchises, the settlement of disputes between Undertakers, the revision of rates, amalgamations into joint schemes, the approval of new issues of share capital, technical regulations and inspection, and not only to regulate but to press forward the development of such services.

What the effect of these Commissions may be upon the ultimate development of the electric supply industry in the States cannot yet be judged, but I have looked in vain for any serious criticism by those most nearly concerned of the principle there adopted, while the remarkable strides which are taking place in the consolidation of Central Station interests at the present time would tend to show that their effect is, on the whole, a beneficial one.*

It is almost unnecessary to remark that one of the factors which have largely contributed to rapid progress in other parts of the world, is the facilities which exist for an extended use of overhead wires for transmission and distribution purposes. Such extensive schemes as I have already referred to, chiefly in America, could not possibly have been developed otherwise.

The use of overhead wires in this country has always proved a matter of some difficulty, and some of the complaints which have been made from time to time have been as follows:—

1. The objection of the Board of Trade to the use of overhead wires.
2. The difficulty of obtaining wayleaves across country, and the absence of legislative assistance in this matter.
3. The arbitrary powers granted to Local Authorities.

With reference to the first of these complaints, whatever may have been its attitude at one time, there is no doubt that for a number of years the Board of Trade, thanks largely to its Electrical Adviser, has facilitated the use of overhead wires in every possible way, with due regard to public safety. There is a substantial saving in first cost, even with the very best construction, by the use of overhead wires in place of underground cables. The higher the voltage, the greater the possible saving becomes, while at pressures exceeding 30,000 to 40,000 volts, 3-core cables for three-phase transmissions can no longer be used, except perhaps in short lengths.

The highest pressure hitherto used on overhead lines in this country is 20,000 volts, but I have not the least doubt that, given a good standard of construction and the adoption of modern protective devices, the Board of Trade would be quite prepared to allow the use of overhead wires up to any voltage which is likely to be required here. The Power Companies in this district have already 170 miles of overhead transmission lines, chiefly running at 20,000 volts.

The difficulty and delays in obtaining wayleaves are a serious obstacle in the development of overhead construction, and our position in this respect compares very unfavourably with that of other countries, notably Italy and Switzerland, which have adopted legislation compelling the grant of wayleaves for overhead lines across private land. Such works are there viewed as of public utility, and private interests are not allowed, subject to compensation, to take precedence of the general interests of the community.

We unfortunately cannot hope to obtain greater powers than our Post Office, and we take such a different view of the rights appropriate to the ownership of land than is common in more democratic countries, that I am not at all sanguine of our being able to secure greater facilities from Parliament possibly within our generation.

It follows that the use of overhead wires for transmission purposes is at present to a large extent at the mercy of our landowners, but we are fortunate in the North in that the land is largely in the hands of large owners, whose interests

* A leading New York Banker has stated in an address recently that the electrical industry in the States can profitably employ a capital of eighty million pounds per annum for the next five years.

are so intimately bound up with the industries whose needs we seek to supply, or, if not, who are already so well accustomed to wayleave matters in connection with the mining industry, that apart from delays, we do not experience the same difficulties as are perhaps strongly felt in some other parts of the country. The slow progress of negotiations is, however, a serious, but in the circumstances, an inevitable objection, which we must at present accept with the best grace possible.

The Electric Lighting Acts have probably done more to discourage overhead wires than all the rest put together, by stipulating that before any overhead wires are erected the consent of the Local Authority must be obtained. This stipulation not only applies to the erection of overhead wires in public streets, but to all overhead wires, even if erected entirely on private land. On the other hand, an individual or Company which does not work under an Act or Provisional Order can erect overhead wires on private land without the consent of the Local Authority, and in the absence of special local by-laws, of which very few are in existence, can erect overhead wires across public roads without seeking any consent from the Local Authority, provided the consent of the owners of the soil on each side of the road is obtained, and also that the wires are erected at such a height above the roadway that no obstruction is caused.

Lastly, non-statutory Undertakers are not compelled to erect their works in the first instance in compliance with any regulations of the Board of Trade, except that the Board of Trade may, if it thinks fit, serve a notice upon the owners of such overhead lines requiring that they continue to be used only in accordance with such regulations as the Board may prescribe.

It is, in my opinion, essential that an early opportunity should be taken to amend the Electric Lighting Acts in this respect, for if, as all agree, regulations are essential in the case of statutory Undertakers, how much more are they necessary in the case of non-statutory bodies, who are usually the least qualified by reason of their not being primarily engaged in electrical work.

Efforts should also be made to secure a curtailment of the absolute veto of the Local Authorities in regard to overhead wires, particularly if it be not proposed to erect these wires along public thoroughfares, and the Local Authorities' consent should, in all cases, be made subject to an appeal to the Board of Trade. At present a single Local Authority may imperil the successful carrying-out of a large project in which it has no particular interest, while this power is further open to abuses which need not be further specified.

A great deal of the prejudice which exists against overhead wire arises from the haphazard fashion in which much of it is put up. Crooked poles, neither set plumb nor in line, wires run with all sorts of twists and angles, ugly cross arms, etc., certainly add nothing to the beauties of the landscape, and yet it is remarkable how little objection can reasonably be offered to overhead wires when these and other details have been carefully studied. Good overhead line work is entirely a matter of minute attention to details of design and construction which many seem indisposed to give, or perhaps to pay for.

If we are to obtain the best results in the supply of electrical energy over wide areas, it is of no small importance that the capital cost of our transmission systems be kept as small as possible, and the use of overhead wires at high pressures enables this to be achieved in a marked degree. It is not only that overhead transmission lines across country usually enable a considerable saving in route length to be made as compared with underground cables laid along roads, but even length for length and for the same sectional area of conductors, the capital cost of a first class 20,000-volt overhead line is only approximately one-half that of a similar 20,000-volt underground cable, while if the pressure were raised to say 60,000 volts, at which pressure the use of three-core three-phase underground cables would no longer be possible, the capital cost per kilowatt of such an overhead line would only be from one-fifth to one-sixth of that now incurred for a 20,000-volt underground cable of equal section.

The chief obstacle at present in the way of the adoption of higher pressures is the heavy cost of switchgear for these higher pressures, which, in this country, where the average distance between switching points is small, becomes the predominant factor.

On the other hand, the use of higher pressures than 20,000 volts will become a necessity, if only to deal with the heavy loads which have to be transmitted and which will soon exceed the possibilities with 20,000-volt lines.

A further consideration in the use of higher transmission pressures in this country is the practical impossibility, for many and various reasons, of erecting an entirely continuous overhead system, and most of our overhead lines must of necessity include a fair percentage of underground cables over sections of the route; therefore, whatever pressure may be adopted for the overhead system must also be suitable for use with underground cables. This leads to an examination of the high-voltage cable position.

No very notable advance can be recorded since the laying of the extensive 20,000-volt three-phase cable system in this district some seven years ago, if we except a large system of 30,000-volt 3-phase cables laid in Berlin about two years ago, following upon the experience obtained here.

There are, I understand, some short lengths of 45,000-volt 3-core 3-phase cables in use in France, but this, as far as I know, is the highest pressure hitherto applied to 3-core cables in commercial service, and it is difficult to foresee any possibility of greatly exceeding this or even much lower pressures on a large scale on account of the heavy capacity currents and increased dielectric losses (which are continuous losses and independent of the load) which would be experienced at our usual frequencies. While with cables these losses increase in proportion to the square of the voltage, they are practically non-existent on overhead lines up to the limit of pressure at which corona effects take place. Another factor which largely determines the highest pressure which can economically be dealt with by an underground 3-core cable is that of the maximum diameter and weight of cable which can be handled. Beyond this, it is necessary to resort to the use of three single-core cables at a greatly increased cost. At present I would set down the superior practical limit of pressure for 3-core cables at not more than 40,000 volts, while there is no very obvious difficulty in constructing single-core lead-sheathed cables for three-phase working up to a working pressure of 80,000 volts between phases, that is, nearly 50,000 volts per cable with the neutral point earthed. Capacity currents, and the copper and dielectric losses to which they give rise and also sheath losses arising from the use of single cables, would not prove of serious importance if these cables were used as an adjunct to our overhead lines in moderate lengths, distributed as usual at points along the route.

I therefore apprehend no serious difficulty in increasing our overhead line pressures to anything between 60,000 and 80,000 volts if required.

Considering the importance of the subject, our knowledge of the science of cable design is still very incomplete, and although the general principles are fairly well established, there is a remarkable dearth of technical data upon the properties of extra-high-tension cables. It is evident, for instance, that our thicknesses of insulation for E.H.T. cables are in many cases unduly liberal and purely arbitrary. From what we know of potential gradients, it is clear that a thickness of insulation which will be correct for a large size of core, as, for instance, 0.25 square inch, will not necessarily be correct for a smaller core, or for a round core against a clover-leaf core. The potential stresses will be relatively much greater in each of the last mentioned cases, and yet we find that our engineering standards do not discriminate between such cases, but even allow thicker insulation on the larger sizes of cables compared with the smaller. It is no wonder that many of our paper cables frequently show factors of safety of 10, or even more, under test, and we might well refer to such as factors of ignorance.

One cannot commend our lack of enterprise in research. While our cables undoubtedly rank as the best in the world, this position has been arrived at more as a result of careful attention to details of manufacture than by the application of scientific principles to design. Although there are happily signs of an awakened interest in this matter, still there appears hitherto to have been no co-ordinated effort to place it upon a sure foundation, and yet I feel confident that a full investigation should enable a reduction to be made in our thicknesses of insulation, with a consequent saving of possibly anything from 10 to 25 per cent. in the cost of extra-high-tension cables (6,000-volt and upwards) as the result of smaller over-all diameters and the consequent cheapening of lead sheaths and armouring. This question is one for further investigation, but, in the meantime, we may take some comfort from the prospect that many of our existing cable systems are capable of being worked satisfactorily at much higher pressures than those for which they were originally laid down.

Our known workable coal measures must at the present rate of working become exhausted hundreds of years before those of our nearest industrial rivals. Notwithstanding this striking fact, we continue to export some 30 per cent. of our total output, or 87 million tons of coal last year. In the face of such figures, it seems futile to expect that anything we can do towards conserving our coal resources will for a long time to come be more than insignificant, when we consider that the entire coal consumption of our public electric supply undertakings in 1907 was well under 3 million tons, and cannot at the present time exceed 5 million tons. Yet some remarks as to the possibilities in this direction by the utilisation of waste heat may not be without interest.

The chief sources of this waste heat are coke ovens and blast furnaces. Our annual production of metallurgical coke from coke ovens is about 13 million tons, in the manufacture of which some 200,000 million cubic feet of gas of an average calorific value of 500 B. Th.U. is liberated. About half of this gas may be profitably utilised in heating the ovens, in the case of regenerative by-product recovery gas ovens, leaving an equal amount available as a by-product. Assuming, therefore, 100,000 million cubic feet of disposable gas and a heat consumption of 10,000 B.Th.U. per B.H.P.-hr. if used in gas engines, over one half-million horse-power (587,000 H.P.) might be made available continuously by the proper recovery and utilisation of this waste gas. Only about 20 to 25 per cent. of our coke ovens are of a type which allows any recovery of the gas to be made; but we may expect to see a very large increase in the installation of by-product recovery ovens in the near future.

Our blast furnaces produce some 10 million tons of pig iron annually, and assuming an output, upon a conservative

estimate, of 150,000 cubic feet of gas of an average calorific value of 100 B.Th.U. per cubic foot for each ton of pig iron produced, if the disposable gas, which is about 40 per cent. of the whole, were also utilised in gas engines, another 685,000 H.P. could be made available.

Taking both these sources of waste heat, we find, therefore, that even if only 80 per cent. were made use of, some one million horse-power could be utilised continuously, of which at present the greater part is entirely wasted.

This is quite irrespective of the utilisation of the exhaust steam from reciprocating engines, as to the amount of which I have no figures.

I think we may look to see some interesting developments in the utilisation of these waste gases within the next few years, both for the production of electricity and for town gas lighting. Use is already being made of coke-oven gas for town lighting in Germany and America, and, to come nearer home, the town of Middlesbrough has just entered into a contract with a firm of ironmasters to take the whole of its town gas supply from coke ovens, while another interesting experiment is that of the Corporation of Birmingham, which has put down some coke ovens primarily to produce town gas and to dispose of the furnace coke produced as a by-product. Seeing that coke-oven gas should be obtainable at some figure below 6d. per 1,000 cubic feet, keen competition may be anticipated in those districts where such gas is available.

The utilisation of waste heat to its fullest extent for electrical purposes is only possible to those Power Companies with widely ramifying networks, as much of it is only available at some distance from the large centres of population and chief points of power utilisation, but by feeding into the main network at so many points remotely situated from the chief power stations, considerable economies in the transmission system and its losses may be attained.

There are, of course, objections in the way of its rapid adoption, such as the limited quantities of waste heat usually available at any one plant, which would result in heavy capital cost for small stations, but when the use of by-product recovery ovens becomes more general, it will doubtless in some cases be possible to concentrate the generating plant, the gas being piped from a number of near-by coking plants to a power station placed at some point favourably situated with respect to these sources of production.

Another, and perhaps at first sight more serious, objection, is the liability to interruptions from labour troubles and industrial depression, resulting in the shutting-down of the producing plants. Some alternative method of keeping the station plants in operation, such as coal or oil-firing, or producer or oil gas if gas engines are used, would be desirable at some of these stations, but not necessarily at all. This might in these cases be necessary to maintain the general scheme of distribution in the transmission system, although loads would obviously be very much diminished in such circumstances.

I do not think I need pursue these and other technical aspects of the problem of the centralisation of power supply any further. The hindrances to our progress are by no means technical in character, and it is true that the world's achievements in electrical and mechanical engineering are far in advance of any of the possible requirements of this country for many years to come. When we learn, as from the States, of 30,000-kilowatt turbo-generators, of which seven are already under construction, the daily operation of high-voltage overhead transmission up to 140,000 volts and covering distances up to 240 miles, of 300,000 horse-power central-station developments and the electrification of some hundreds of miles of main line railway, we need have no fear as to the ability of engineers to keep pace with the world's industrial demands. But, for ourselves, can we ever hope to maintain our position in the Electrical Engineering world if we are content to allow our electric supply industry to develop along its narrow way; indeed, have we not already lost too much ground? What training ground shall we offer the rising generation of British Electrical Engineers if we wish to take our part in the electrical development of our Empire overseas, and how shall our electrical manufacturers assume their proper place in the markets of the world when handicapped at home by a restricted market, which might easily be increased to many times its present proportions? Truly this question is more far reaching than may appear at first sight. It is not my intention to discuss here the seemingly delicate question of how we may best reconcile the different and admittedly powerful interests which at present operate to the disadvantage of our industry, and I shall esteem my task well done if I but succeed in turning your thoughts in this direction.

Western Local Section.

On Monday last the Section opened its new session. In the morning the tobacco factory of Messrs. W. D. & H. O. Wills was visited by a large party of members, who were received by Mr. R. Earle, chief engineer to the Company. Most of the plant is electrically driven, but the visitors were mainly interested in the manufacturing processes, which are rarely shown by the firm.

In the afternoon the opening meeting was held at the Merchant Venturers' College of the University of Bristol; Professor Wertheimer welcomed the members on behalf of the University, and Mr. H. Faraday Proctor, the new chairman, read his address, of which we give an abstract below. The President, Mr. W. Duddell, proposed a vote of thanks, to which Mr. Proctor briefly responded; the members then adjourned to the electrical laboratories, where Professor David Robertson demonstrated an improved pattern of friction brake which, with the aid of the stroboscopic method of measuring the speed and maintaining it constant, and an ingenious self-compensating device for the brake torque, enabled brake tests to be made with an accuracy of about one part in 1,000.

In the evening the annual dinner took place at the Royal Hotel, about 90 members and guests being present. Mr. Proctor presided, and was supported by Mr. Duddell, Mr. J. F. C. Snell, Mr. Judd, and Mr. Rowell, from headquarters, and Mr. W. A. Chamen (retiring Chairman), Alderman Pearson (Chairman of the Electricity Committee), Mr. D. Roberts (Vice-Chairman of the Section), Mr. W. Collins (who with Mr. S. B. Haslam is joint Hon. Secretary) and other prominent members of the western district.

After the loyal toast, Mr. Proctor proposed "The Intitution of Electrical Engineers," which, he said, had done much for the industry, but was only at the beginning of its activities; amongst the many matters awaiting its attention he referred in particular to organisation, standardisation and research. He entered a vigorous protest against the industry's neglect to protect the interests of its younger members in charge of central-station plant, who in many cases would be much better off in point of salary if they exchanged positions with the men under their orders. They went through a full electrical and mechanical training and were expected to act, on their own initiative, with promptitude and discretion in emergency, and they carried out their duties wonderfully well in spite of their poor pay; he hoped the Institution would take action on their behalf. Mr. Proctor cordially welcomed the President, whose work in wireless telegraphy and other branches of scientific engineering was well-known, and who was an equally keen worker on behalf of the non-technical side of the industry; his progress had been wonderfully rapid, and the high esteem in which he was held by the Institution was evidenced by his election as President for two years in succession, the highest honour that the electrical industry could confer upon its members.

In his reply, Mr. Duddell agreed with the Chairman's remarks regarding the broadened views of the Institution, and emphasised the importance of standardisation, which was a question of vital interest to our manufacturers; if they were to compete successfully in the world's markets, they must see to it that international standards were adopted for the rating of electric machinery, which would be fair to all parties, and the Institution was acting with that end in view. Standardisation of the smaller apparatus also, such as those which affected the consumer, was urgently needed. During the coming winter a great deal of valuable research work would be in progress; the investigation of magnet steel had been begun, the heating of underground cables was to be determined, and the co-ordination of wireless research by means of the new International Commission, on which the Institution of Electrical Engineers was represented, would be undertaken. He sympathised with the younger members of the profession, having himself experienced the difficulty of securing a reasonable salary on the completion of an extended training in both mechanical and electrical engineering.

Mr. J. F. C. Snell proposed "The Western Local Section," and expressed the firm belief that at no distant date the Institution of Electrical Engineers would be the premier engineering institution of the Empire, for electricity was becoming an indispensable factor in every branch of engineering. The original idea in founding the local sections was that they should continue and add to the discussions on papers read before the parent Institution; while they preserved their individuality, they should remember that they were all partners in one organisation, and they could help the parent Institution in three ways: by holding meetings, and producing papers of interest to the whole membership; by forming recruiting centres and encouraging young engineers to become Associate Members by passing the examinations, which would do a great deal to raise the status of the Institution; and, in the future, by carrying out the examinations on behalf of the Institution at the local centres. He pointed out the importance of the Western Local Section, which included not only Bristol, but also South Wales, Plymouth, and Cornwall.

Mr. D. Roberts in reply referred to the unfortunate division of the district by the Bristol Channel; in spite of this difficulty, however, the average attendance at the meetings had been about 50.

Mr. W. Judd, proposing "The Visitors," commended the authorities of the University for their regard for the humanities; strictly technical training was not sufficient—arts and sciences ought to go hand in hand. Too much "shop" made a man one-sided, and literary ability was not without value in commercial work; narrow views produced a stunted imagination, and that was bad for one's business career as well as for one's happiness. He drew the attention of the municipal authorities of Bristol to the abolition of the smoke nuisance as a worthy object of their enterprise, for the sake of the health of the children of the poorer class of town dwellers.

In reply Alderman Pearson, who expressed surprise at finding himself in the position of a visitor in Bristol, referred to his

22 years' association with Mr. Proctor in the conduct of the City's electrical undertaking. He humorously regretted the scarcity of fogs in Bristol as a cause of loss to the electricity works, and emphasised the necessity for a municipal committee to stick to the commercial management of the undertaking, leaving the technical work to the electrical engineer.

Mr. W. A. Chamen proposed the health of the Chairman, in whom he felt the greatest confidence; the toast was accorded musical honours and Mr. Proctor expressed his determination to do his best for the Section.

An excellent entertainment was provided by Messrs. Townsend, Royce, Thomas and Stonelake, whose joint and varied talents are worthy of the highest praise.

In the course of his inaugural address, Mr. H. Faraday Proctor reminded the members that about 3½ years ago he was approached by their late Chairman, who invited him to accept nomination for the Council of the Institution, and to promote if possible the formation of a Local Section of the I.E.E. for the Western Counties. The Section was formed, and had now completed the first year of its existence, with a success which exceeded the anticipation of the promoters.

It must be borne in mind that the object of a Local Section was not confined to the welfare of its members: it was formed with the view of enabling its members to do that which would be of use to the Institution as a whole, and the Electrical Industry generally. It was desirable therefore that papers read and discussed at the Sections should not be of local interest alone; but should, as far as possible, appeal to the greater body of members and be read and discussed at the Institution Headquarters and other Local Sections.

Advice was so often sought as to the proper course of training for an Electrical Engineer, that he might be pardoned for introducing a few comments upon that subject. It was desirable that the boy be first a gentleman; secondly—make him into a man; and thirdly—into an engineer. If he lacked the instincts of a gentleman, he would not gain confidence; if he had not learned to behave like a man he would progress but slowly on his own initiative, and would require constant pushing, whilst if he had not the elementary principles of engineering ingrained, he would not get on even when pushed.

Mechanical engineering was the broad foundation upon which electrical engineering was based; the mechanical engineering must itself have a foundation broad in proportion to the superstructure to be erected upon it, and capable of unlimited expansion. The young engineer did not know in what particular direction he might have to develop, and a broad intelligence based upon a sound general education was the best asset of an engineer.

The American definition of an Engineer was: "A man who can do for one dollar, that which any fool can do for two." It was only by close attention to the commercial or financial side of business that men could hope to rise, and he was particularly glad that their Institution had recently allowed itself to deviate from confining its attention to the consideration of matters from the scientific point of view alone.

He looked upon Standardisation as the key to cheapness (without nastiness), and Co-operation as the key to Standardisation. A great work had been undertaken by the Engineering Standards Committee, and great good had already resulted. He looked forward to the time when the standardisation of two-pin plugs and sockets, heavy-current lamp holders and fuse terminals would remove the most common source of the every-day consumer's little worries.

Few could realise the economy of time and freedom from worry that would result from anything approaching prefect method in office working. The standardisation of paper sizes would greatly facilitate filing. Efforts had been made in this direction, and a little had been done; much more might be done. The need for standardisation, with the resultant economy became the more urgent in Electricity Supply Departments owing to the decreasing revenue derivable from the individual "lighting" consumers. In 1909 a careful comparison was made of the consumption of electricity by a large number of consumers in Bristol who had installed one-watt lamps throughout their premises with that of the same consumers when using carbon-filament lamps. The result showed an average economy to the consumer of 53.8 per cent. Since, however, the one-watt lamp represented an economy of about 68.5 per cent., it was evident that those consumers on the average had increased the candle-power installed by about 50 per cent. It was interesting to note that after a lapse of four years, the proportionate figures still held good. From this it would appear that the average consumer had been educated up to require illumination 50 per cent. in excess of that with which he was satisfied before the introduction of one-watt lamps. With the advent of the "half-watt" lamp, he believed a similar result would be obtained.

Lighting by electricity would, with the half-watt lamp, cost so small a sum that business premises would be more generously lighted, and in residences artistic effect would be given greater consideration, whilst less attention would be paid or necessitated as regards economy.

Since the light given forth by the half-watt lamp was very much whiter than that of the one-watt lamp, it should be excellent for the judging of colours. The lamps should, however, be kept well out of the direct line of vision—thus indirect lighting should be encouraged to the utmost extent. The cost of electric light would be so reduced as to put all competitive forms of illumination out of court, and the fact that electricity would henceforth be adopted for lighting all premises requiring artificial illumination (even if only for the sake of economy) would tend to keep the cable system satisfactorily loaded.

With the diminished revenue per consumer, the cost of making new connections would become a still more serious factor in the costs of supply. In Bristol the present cost of connecting premises adjoining the mains was £3 8s. 0d. (exclusive of the cost of the meter). Since the average revenue per connection derived from so many as 20 per cent. of the lighting consumers amounted to only 35/- per annum, the importance of this item was evident. It was also evident that it was necessary and urgent that the uses of electricity for purposes other than lighting be developed to their utmost, otherwise the lighting consumer might become a serious drag upon the undertakings. Another matter of serious import, which the lighting engineer should bear well in mind, was the probable adoption of a Daylight Saving Bill.

Electric cooking had developed wonderfully during the last year or two, and with the standardisation of details would rapidly displace its rivals. He believed that the satisfactory heating of water for domestic uses would soon remove what was now the greatest obstacle advanced against the introduction of electric cooking. To get rapid and highly efficient water heating it would, he considered, be necessary to use immersion heaters, probably applying the heating element direct to the water, avoiding the risk or possibility of shock by utilising the resistance of two columns of water—one on the supply side and the other on the delivery side of the heating appliance: the supply and delivery extremities of these columns of water, most remote from the heating elements, being electrically short-circuited and earthed. The elements must, in such an appliance, either be self-cleaning or be arranged so that they might be very readily cleaned so as to avoid trouble due to lime or other deposits. He looked to such appliances arranged alternatively, for rapid water heating supplied at the usual heating rate of charge, and for continuous use supplied on a fixed annual kilowatt charge, as the probable solution of the domestic hot-water problem.

In that City the power consumption had increased eight times as rapidly as the lighting consumption during the last 10 years: during the next two years this ratio would be doubled.

It was the Business-Getting Department to which they must look for the bulk of their progress.

What was a "Volt" in 1766?—"Sahib" writes:—**I herewith enclose a definition of a "volt" which recently came to light during a conversation I had with a non-technical friend who wanted some information respecting amperes, ohms and volts of the *usual* type for motor-car purposes. I had given him the usual elementary reply to his query, and then forgot the matter. However, he had not, but turned up with a dictionary with the following explanation:—**

"Volt. In the manège, a round or circular tread; and hence by the phrase, to make volts, is understood a gait of two treads, made by a horse going sideways round a centre in such a manner that these two treads make parallel tracts, one larger, made by the fore feet, and another smaller, made by the hind feet, the croup approaching towards the centre, and the shoulders bearing outwards.

"Sometimes the volt is of one tread; as when a horse makes volts in corvets and in caprioles, so that the haunches follow the shoulders, and move forwards on the same tread.

"A renversed volt is a tract of two treads, made by the horse with his head to the centre and his croup out; so that he goes sideways upon a walk, trot or gallop, and traces out a small circumference with his shoulders, and a larger one with his croup.

"This different situation of the shoulders and the croup with respect to the centre, give this volt the name of renversed, as being opposite in situation to the former."

Load Factors in Large Power Station.—**With the increasing diversity of the load on large power stations, and the better terms offered for limited night and early morning supply, the load factors are steadily improving. The following figures for December, 1912, are of interest:—**

The Commonwealth Edison Co., of Chicago, had a peak load of 233,000 KW., an annual output of 799 million units, and a load factor of between 43 and 44 per cent.

The New York Edison Co. had a peak load of 210,800 KW., an annual output of 619 million units, and a load factor of 33·4 per cent.

The Brooklyn Edison, Boston Edison, and Philadelphia Electric Companies, with peak loads of from 40,000 KW. to 66,000 KW., had load factors of 33·7, 30·6, and 32 per cent. respectively.

The Victoria Falls and Transvaal Power Co. expects the load factors of most of its stations to be shortly in the neighbourhood of 70 per cent., on account of the almost continuous work at the mines.

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TUNGSTEN LAMPS OF HIGH EFFICIENCY.

The last issued number of the proceedings of the American Institute of Electrical Engineers contained two extremely interesting papers, one by Mr. Irving Langmuir, on the blackening of tungsten lamps and methods of preventing it; the other by Messrs. Langmuir and J. A. Orange, on nitrogen-filled lamps.

The author of the former points out that with perfect efficiency white light would be produced with the expenditure of only 0·1 watt per candle, so that the ordinary tungsten lamp has an efficiency of only 6 to 10 per cent. The lamp can be run up to an efficiency as high as 0·2 watt per candle before melting; its commercial efficiency is not determined by the melting-point of the filament, but by the blackening of the bulb. The fragility of the filament, once so serious a factor, has nowadays been completely overcome by the production of ductile tungsten wire and by the adoption of improved methods of mounting the filament; the life of the lamp is therefore determined solely by the loss of candle-power due to blackening of the inner surface of the bulb, the changes in candle-power of the filament itself being insignificant.

In order to ascertain exactly the cause of blackening, and thus to render possible the use of higher efficiencies, an extended research was undertaken. Experience indicated that it was due primarily to minute traces of residual gas, or to electrical discharges within the bulb; special apparatus was therefore devised to study the sources of gas within a lamp, and the effects produced by various gases. It was possible with this apparatus to make a quantitative chemical analysis of a single cubic millimetre of gas.

Most of the gases are nearly completely removed, or precipitated on the walls of the bulb, by the "clean-up" that takes place when phosphorus is volatilised into the lamp and the filament is flashed, the final pressure being about 0·001 mm. It was found that the gas evolved from the filament—mainly carbon monoxide—was given off within a few seconds on first heating the wire above 1,500° C. In large lamps gas is evolved from the leads and anchor wires. But these gases, and the residual gases, are quite insignificant compared with the gas on the inner surface of the bulb; a 40-watt lamp bulb, after being thoroughly dried, gave off 200 mm.^{3} of water vapour at 200° C., a further 100 mm.^{3} at 350° C., and 150 mm.^{3} more at 500° C., besides 30 mm.^{3} of carbon dioxide, and 5 mm.^{3} of nitrogen. The great difficulty of completely removing the gases from the bulb makes this source particularly troublesome.

Small quantities (up to 0·1 mm. pressure) of various gases were let into lamps, and their effect on the operation of the lamps was noted; each gas produced characteristic phenomena. Dry hydrogen had not the slightest tendency to produce blackening of the bulbs, at any pressure. Oxygen formed a yellow oxide, which was deposited on the bulb, but did not produce blackening. Nitrogen caused the formation of a brown deposit of tungsten nitride, but under practical conditions never caused any discoloration of the bulb. Carbon monoxide and carbon dioxide were not responsible for blackening. Water vapour, even at very low gas pressures, reacted with the tungsten filament and caused rapid blackening of the bulb; lamps exhausted at low temperature (100 to 200° C.) blacken very rapidly, and have a short life due to its presence. Apparently the oxygen combines with the tungsten filament and liberates hydrogen: the oxide is distilled and condenses on the bulb, where it is reduced by the hydrogen to metallic tungsten, with the reformation of water vapour, so that the process can go on indefinitely. Methane and argon, as well as many other gases, including mercury vapour, were acquitted of blackening.

In order to remove water vapour as far as possible, lamps were exhausted in a special vacuum oven, in which they could be heated about 100° C. higher than when exposed to atmospheric pressure; they were sealed off when the internal pressure was reduced to 0·00005 mm. Contrary to expectation, however, they were not materially better on life test than the best of the lamps made regularly in the factory. Lamps exhausted in the vacuum oven were run at 0·7 watt per candle, with the bulbs immersed in liquid air; others with the bulbs at room temperature; and others with the bulbs heated to 150° C., during their whole life. The life of all three sets was practically identical. The conclusion was that the blackening of the bulbs of ordinary well-made lamps was not caused by imperfect vacuum.

Experiments were next made to determine whether the blackening was due to evaporation of the filaments; it was found that the loss in weight of filaments was proportional to their surface, and measurements at various temperatures agreed closely with the theoretical values of the vapour pressure of tungsten, which is at—

1·0 watt per candle	(2,400° absolute),	0·000,000,05 mm.
0·4 " "	(2,800° "),	0·000,03
0·2 " "	(3,540° "), (melting point)	0·080
	(5,200° absolute), (boiling point).	760

The conclusion was that the evaporation of the filament was the true cause of blackening. A lamp was filled with hydrogen at atmospheric temperature, and run at normal temperature for 360 hours without perceptible blackening of the bulb, though the heat loss by convection was so great that 17 watts per candle were required to maintain the temperature. The life of a filament in vacuum, with a bulb as hot as in this case, would have been very short indeed. The heat conductivity of hydrogen at very high temperature was subsequently found to be abnormally great, the hydrogen molecules being dissociated into atoms. In mercury vapour the heat loss by convection was extremely small, and the rate of evaporation was very greatly decreased. Nitrogen at atmospheric temperature was entirely inert towards the tungsten, and conducted very little heat, the efficiency being as high as 0·24 watt per candle at a temperature near the melting point of tungsten, with a filament of fairly large diameter. Unfortunately, it was found that the heat loss by convection from very small wires was nearly as great as from much larger wires, so that with wires of the sizes ordinarily used in lamps the temperature would have to be raised excessively in order to obtain an efficiency of even 1 watt per candle. Thus in nitrogen a filament of 0·001 in. diameter (as used in a 20-watt 110-volt lamp) would have to run at 3,000° C. to give 1 watt per candle. At this temperature of filament, the life of the ordinary lamp would be about 20 minutes. With filaments of larger diameter (0·005 in. and more), the loss of heat by convection is not nearly so serious, so that, if the rate of evaporation of the metal is very largely reduced by the presence of the gas, it should be possible to raise the efficiency considerably without shortening the life.

The advantages of a large diameter filament can be practically obtained by coiling a smaller wire into a tightly-wound helix or otherwise concentrating it into a small space.

In lamps with a very high vacuum, the atoms of tungsten given off from the filament by evaporation travel in straight lines until they strike the bulb. They are electrically uncharged. Since the light from the filament also travels in straight lines, according to similar laws, it follows that in a high vacuum the deposit always collects most on those portions of the bulb where the greatest intensity of light passes through the glass.

With nitrogen at atmospheric pressure, the brown deposit of nitride is carried by convection currents to the upper part of the bulb, the glass on a level with the filament usually remaining perfectly clear. This fact is of great importance in connection with lamps containing high pressures of gas. Not only does the gas decrease the rate of evaporation, but it may be made, by proper design, entirely to prevent the blackening of those parts of the bulb that transmit the light.

(To be concluded.)

BUSINESS NOTES.

Dissolutions and Liquidations. — Ohio Power Syndicate, Ltd.—This company is winding up voluntarily, with Mr. E. J. Trollope, of 42, Cranbourn Street, London, W.C., as liquidator.

Adelphi Cycle, Motor, Electrical and General Engineering Co., cycle, motor and electrical engineers, 42, Meadow Lane, Leeds.—James Henderson and Thomas Adamson have dissolved partnership. Mr. J. Henderson will attend to debts and continue the business.

The Cheap Power Supply and Engineering Co., Ltd.—Creditors must send in their claims by December 1st, to the Liquidator, Mr. W. T. Green, 33, Lloyd Street, Manchester.

Anderton & Beatson, electrical and gas lighting engineers, 72, Surrey Street and 14, Waingate, Sheffield.—Messrs. H. Anderton and H. Beatson have dissolved partnership. Debts will be attended to by Mr. H. Beatson.

Shipping Exhibition.—We are informed that success is already assured for the Shipping, Engineering and Machinery Exhibition, which is to be held at Olympia, in the autumn of next year. The list of patrons includes the leading shipping and engineering magnates, the First Sea Lord and the Director of Naval Construction, and a Committee of experts has been formed to ensure that the Exhibition is carried out in a sound and practical manner. The variety of the exhibits can be gauged from the sections into which they have been divided, the principal being the naval engineering section, which deals with war vessels and their equipment; naval architecture, embracing every class of ship; marine engineering, including heavy machinery working under steam, oil, gas, water and compressed air; fishery exhibits; general marine and engineering and foundry and machine tools. There will be an installation of wireless telegraphy, so that messages may be sent from one end of Olympia to the other.

Electric Clocks.—We learn from the Silent Electric Clock Co., Ltd., of Goswell Road, E.C., that they have been exceptionally busy all the year, especially with extensive and important contracts for H.M. Post Office. Other installations, either erected or in hand, include Johannesburg Town Hall; the Hong Kong and Shanghai Bank new head offices; the G.P.O., Alexandria, Egypt; the *Dundee Advertiser* offices; the Piccadilly Hotel extensions; the Y.M.C.A., Melbourne; New Government Buildings, Christchurch, N.Z.; Miller Hospital, Greenwich; Florence Nightingale Hospital extensions; British Syphon Co.'s Works; Indian Telegraph Department; Colombo Observatory, and many other important installations for private houses, while many shipments through overseas agencies have been made to Australia, India, Canada, &c. The company's system has been awarded a Gold Medal at the Ghent Exhibition.

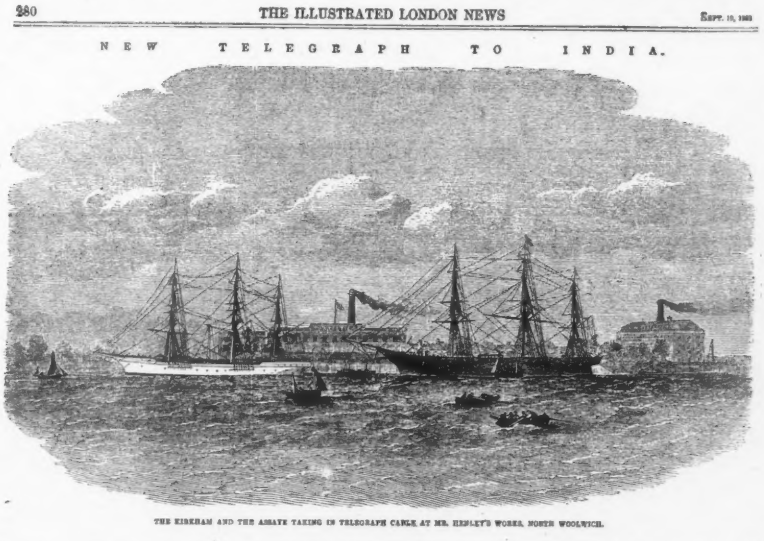
Award.—The Jury of the International Building Trade Exhibition at Leipzig has awarded a Gold Medal (highest award) to the Korfund Co., for their "Korfund" insulation system.

Lead.—In their report dated October 25th, Messrs. James Forster & Co. state:—

"Closing prices last week were £20 15s. October delivery, £20 10s. October shipment, £19 13s. 9d. November, £19 7s. 6d. December, and £18 13s. 9d. January. The market has been quiet and steady throughout the week until the close, when London desilverisers, who on Thursday paid £20 15s. for October delivery, sold at £20 1s. 3d. for October shipment. There is no change in the position. Lead is badly wanted, both for home consumption and for export, the last price bid yesterday for October delivery being £20 12s. 6d., with no prompt offering even at this figure. Export demand continues, and a considerable business has been done for shipment right up to January. The Mexican position seems to get worse rather than better, and in the absence of any relief from that quarter, there is little prospect of other than a continued scarcity of supplies, and manipulations of the market such as we had yesterday can only have a very temporary effect. Consumers are begging for prompt lead, and it is abundantly proved that there are no stocks to be drawn upon anywhere. October shipment lead was done early in the week at £20 15s., and sold down to £20 1s. 3d.; November, £20 to £19 12s. 6d.; December, £19 2s. 6d. to £19; January, £18 16s. 3d.; and February, £18 12s. 6d.; the lower figures representing the close of the market last night. English lead—£20 10s."

Cable-Laying Fifty Years Ago.—The accompanying illustration is reproduced from a woodcut which appeared in the *Illustrated London News* on September 19th, 1863, showing the "*Kirkham* and the *Assaye* taking in telegraph cable at Mr. Henley's Works, North Woolwich." The cargo being taken on board the two ships is a portion of the submarine cable between Bussorah (now Basra) and Karachi, which cable was an important link in the new telegraph line to India then being laid down under the supervision of Sir Charles Bright and Mr. Latimer Clark. The shipping of this submarine cable was quite an important matter in those days, particularly as it was at that time double the weight of any previous submarine cable, the length being 1,250 nautical miles, and the total weight 5,100 tons. Five large sailing ships were used to convey the cable to its destination.

The laying of this new line was undoubtedly of more than ordinary interest at the time, as the *Illustrated London News* devoted four large illustrations to the subject in addition to a long descriptive article. This line was established at the instigation of Sir Charles Wood and the Indian Council owing to the failure to establish electric communication with India *via* the Red Sea and there is no doubt that it was a momentous undertaking.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NEW TELEGRAPH TO INDIA.

THE KIRKHAM AND THE ASSAYE TAKING IN TELEGRAPH CABLE AT MR. HENLEY'S WORKS, NORTH WOOLWICH.

Catalogues and Lists.—Messrs. Thomas Kesnor and Co., Ltd., Whippendell Road, Watford.—Binding cover containing publications Nos. 30 to 35, in which are given illustrations, together with descriptive matter and tabulated prices of the following specialities:—Kesnor patent elevator controller (D.C.); push buttons for lift and remote control work; push button relays; car direction and limit switches; gate locks and automatic motor starters.

The British Thomson-Houston Co., Ltd, Rugby.—Price list No. 7,002 (eight pages), containing an illustrated description of the B.T.H. sewing machine motors for domestic use.

Messrs. Musgrave & Co., Ltd., 35, Maddox Street, London, W.—Large postal card giving illustrated particulars and tabulated prices of their slow-combustion stoves and air-warmers.

Messrs. J. H. Heathman & Co., Parson's Green, Fulham, London, S.W.—Several illustrated lists showing various types of step ladders, extending ladders, telescopic ladder towers, and fire-extinguishing appliances.

Messrs. Pope's Electric Lamp Co., Ltd., Hythe Road, Willesden.—Four new and effective picture postcards (in colour) have been issued by the company. A supply can be provided for customers' use with their names imprinted.

The Davis Electrical Co., 17, Moor Street, Charing Cross Road, London, W.C.—Circular relating to decoration lamps for electrical illumination of Christmas trees, &c., also cards giving particulars of "Delcoblast," a solution for frosting lamps, and the "Ellco" invisible lamp lock.

The Edison & Swan United Electric Light Co., Ltd., Ponder's End.—The company have just issued in postcard form a reproduction of their new poster, in which three coloured gentlemen from afar fall down and worship the sun, which, as a matter of fact, is none other than an Ediswan "Royal."

Thirty-two-page catalogue (second printing) of electric heaters and radiators for the current season. It shows a variety of designs of luminous type radiators (Dowsing patent), with from two to six lamps, convectors and illuminated convectors (Dowsing-Huntley system), log fire heaters, and quartzalite (Bastian) heaters of several shapes and designs. Dimensions, weights, prices and other particulars are given.

Messrs. Archibald J. Wright, 41, Beech Street, Barbican, London, E.C.—Illustrated and priced leaflets relating to a number of electrical and other scientific novelties.

The British Aluminium Co., Ltd., 109, Queen Victoria Street, London, E.C.—Sixteen-page illustrated list relating to the use of aluminium in the construction of automobiles. Tables of weights of aluminium sheets, and of the physical and mechanical properties of brass, steel and aluminium, are included.

The International Time Recording Co., Ltd., 151-155, City Road, London, E.C.—Booklet just issued describing the different methods of wages payment by the premium, bonus, piece-work, balance and other systems. It is entitled "Bonus and Premium Systems of Wages Payment," by Zähler. It will be sent post free to anyone applying to them for it.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., Blomfield Street, London, E.C.—One hundred and four-page fully illustrated catalogue of terminal boxes. The contents are in no way cramped, indeed the illustrations, which are numerous, are of very fair size, and everything is boldly printed. The contents include boxes for indoor and outdoor use for electric light and power, telephone terminal boxes, colliery boxes, &c. The following new types are described:—Single sealing boxes for pressures up to 11,000 volts; right angle boxes for pressures up to 20,000 volts; outside type terminal boxes, in which the cables and tails enter and leave on the underside; telephone terminal boxes; colliery terminal boxes. Several pages are devoted to illustrations of terminal boxes which the company have designed from time to time for various clients.

Thirty-two-page illustrated catalogue (new issue) giving prices and other information relating to wires and accessories for the Henley wiring system. While the publication is largely a reprint of previous editions, there are several additions, such as the Universal bonding clamp, Tee and joint boxes, and Rawlplugs, which have been covered in separate pamphlets. The Henley system is being used in all types of buildings, as the pictures in this pamphlet show.

Mr. A. C. Hands, 30 and 32, Snow Hill, London, E.C.—New catalogue (158 pp.) containing illustrations and prices of a large and pleasing variety of electric fittings which are supplied in many styles and finishes of metal-work, and with shades of different materials. In addition to fittings for residential and business interiors there is a range of cast-iron water-tight fittings and outside lanterns and brackets, while electric radiators, switch-covers, glass, bead and silk shades, and other lines, are also shown and particularised.

Preston Engineering Co., Ltd., Charing Cross Chambers, Adelphi, London, W.C.—Priced leaflet of Preston tungsten-drawn wire lamps.

The Schniewindt Electric Co., Staniforth Street, Birmingham.—Leaflet No. 16 giving prices, &c., of Triumph electric water boilers and stewing pots.

Russia.—According to a St. Petersburg dispatch in the *Financial News*, under the auspices of the United Cable Works, Russian copper wire mills have formed a syndicate with a view to the regulation of sale prices.

Bankruptcy Proceedings. — C. Lewis, electrical engineer, Old Trafford, Manchester.—First and final dividend of 20s. in the £ and 4 per cent. interest, payable October 31st, at the Official Receiver's offices, Byrom Street, Manchester.

H. W. Wilson, consulting engineer, director of limited companies, Liverpool.—Trustee appointed October 22nd: Mr. Louis Nicholas, 19, Castle Street, Liverpool.

Canada.—A firm in Ontario, interested in the erection of a brick-making plant, to cost 50,000 dols. (about £10,250), will require electrically-driven machinery to manufacture plain wire-cut and pressed brick, and also hollow tiles and floor tiles. Some further information may be obtained at the B. of T. Commercial Intelligence Department in London.

Trade Announcements.—Mr. E. C. Beman, secretary of the London Electric Warehouse Co. (formerly the Supplies Department of the Brush Electrical Engineering Co., Ltd.), who was associated for over 12 years with the Edison & Swan Co., and for some time manager of their town department, has resigned his appointment in order to commence business in partnership with Mr. F. J. Allen (late outdoor representative to the Brush Co. and the London Electric Warehouse Co.), as manufacturers' agents and factors of electrical apparatus. They are trading as the Electrical Supplies Co., as already announced.

The sale of the electrical business of the Adams Manufacturing Co., Ltd., to the Igranic Electric Co., Ltd., has now been completed, and the business will be continued by the Igranic Electric Co., Ltd., at the works, at Bedford, and at 147, Queen Victoria Street, London, E.C., and the branch offices. All moneys due to the business belong to the Igranic Electric Co., Ltd., who will also pay all accounts in connection with the business incurred since April 11th, 1913. They announce that they are prepared to undertake contracts for the manufacture and supply of motor-control gear for all purposes.

The business formerly carried on by Messrs. T. L. Hellyar and Sons at 196, King Street, Hammersmith, is now being carried on by Hellyar & Sons, Ltd., at 169, Church Road, Barnes, S.W., Mr. T. L. Hellyar having retired from business two years ago. All communications should be addressed to 169, Church Road, Barnes, S.W.

Messrs. J. H. Heathman & Co., of Parson's Green, have added a new factory 85 ft. × 58 ft. to cope with increasing business, and a water tower 65 ft. high has been erected for an installation of the Heathman automatic sprinkler fire protection. The firm has received a gold medal for its exhibits at the Imperial Services Exhibition.

Mr. Albert Maund, electrical engineer and contractor, has removed from 13, Corporation Street, Southport, to Electricity House, 327, Lord Street, Southport.

Book Notices.—"Electricity in the Service of Man." By R. Mullineux Walmsley. Vol. II. Section 1. 1913. London: Cassell & Co., Ltd. Price 7s. 6d. net.

"Alternating-Current Problems." By Louis Cohen. 1913. London: Hill Publishing Co. Price 12s. 6d. net.

"Dynamo and Motor Attendants and their Machines." By Frank Broadbent. Seventh edition. 1913. London: S. Rentell and Co., Ltd. Price 1s. 6d. net.

"Recent Physical Research." By David Owen. London: *Electrician* Printing and Publishing Co, Ltd. Price 3s. 6d. net.

"Second Report of the Institution of Civil Engineers' Committee on Reinforced Concrete." 1913. London: Wm. Clowes & Sons, Ltd. Price 2s. 6d. net.

"*Proceedings* of the Engineering Association of New South Wales." Vol. XXVII. Sydney: The Association.

"Telephone Cables." By J. C. Slippy. 1913. Pittsburg, Pa.: The Author. Price $2.50.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXII, No. 10. October, 1913. New York: The Institute. Price $1.00.

"The Physical Review." Vol. II, No. 3. September, 1913. Lancaster, Pa.: The American Physical Society.

"Atti dell'Associazione Elettrotecnica Italiana." Vol. XVII, No. 18. September 30th, 1913. Milan: Stucchi, Ceretti & Co. Price L.1.50.

"Elementary Theory of Alternating-Current Working." By Capt. G. L. Hall. 1913. London: *Electrician* Printing and Publishing Co. Price 3s. 6d. net.

"Electric Lighting." By A. H. Avery. 1913. London: Cassell and Co., Ltd. Price 2s. net.

"Clock Repairing and Making." By W. J. Garrard. 1914. London: Crosby Lockwood & Son. Price 4s. 6d. net.

"The Principles of the Application of Power to Road Transport." By H. E. Wimperis. 1913. London: Constable & Co., Ltd. Price 4s. 6d. net.

"*Mechanical World* Pocket Diary and Year Book for 1914." Manchester: Emmott & Co., Ltd. Price 6d. net.

"*Transactions* of the Institution of Civil Engineers in Ireland." Vol. XXXIX. Dublin: The Institution.

LIGHTING and POWER NOTES.

Acton.—Electricity Accounts.—Mr. S. Lord, accountant to the U.D.C., with regard to the accounts of the Metropolitan Electric Supply Co., Ltd, a summary of which appeared in the Electrical Review last week, has furnished Councillor Hamilton, who sent in a question in regard to the report, with the following reply: "The actual payments during the year 1912 for loans, instalments, and interest on the loans raised by the Council totalled £5,111. Assuming the additional capital expenditure by the company since the date of the transfer, amounting to £33,362, had been made by the Council, and had been borrowed on the same terms as the loans already raised for electricity purposes, the annual repayments therein would have amounted to £2,068. Deducting the gross profit as shown by the company's accounts, viz., £2,974, the charge upon the rates would have been £1,205."

Algeria.—Good progress is being made with the erection of the central station which is being established at Oran by the Société des Exploitations Electriques. It is hoped that the plant will be ready for operation by the end of the year.

Argentina.—The Cia Anglo-Argentine de Electricidad has made a proposal to the Chivilcoy Municipality to extend electric lighting in that city at a cost of about $250,000, which would include the cost of new machinery in the power house.—*Review of the River Plate.*

Australia.—The Grafton T.C. is considering the question of supplying the town with electricity, produced by water-power, at an estimated cost of £11,000.

The Sydney Municipal Council proposes to borrow £250,000 for the purposes of the electric lighting undertaking.—*Tenders.*

Barnes (Surrey).—L.G.B. Inquiry.—An inquiry was held this week into the application of the U.D.C. for a loan of £3,000 for generating plant, &c., at the refuse destructor, to be utilised in connection with plant for making paving slabs.

Barnsley.—The T.C. has decided to include in the provisions of a Bill to be promoted, a clause enabling the Council to sell, let, hire, and fix electric fittings, apparatus, &c. When the matter came before the Council, Mr. Mundsley asked whether it was the intention that the Council should set up shopkeeping in opposition and competition with tradesmen. If so, he should oppose the clause. The Mayor replied that it was not their intention to go into competition with private traders; they were simply getting full powers. The clause was agreed to.

Bedford.—The T.C. has decided to apply to the L.G.B. for a loan of £600 for transformers.

Bradford.—New Plant.—The Electricity Committee has passed the following resolution:—"That, if found advisable, a 5,000-kw. turbo-generator be substituted for the 3,000-kw. turbo-generator recommended in the engineer's report on the installation of additional plant at the Valley Road Electricity Works, at an estimated additional cost of £5,000."

Canada.—The International Joint Commission met in Ottawa recently, and disposed of the preliminary hearing of the Michigan and Lake Superior Power Co. for permission to build a dam at Sault Ste. Marie, and granted the application of the Olgoma Steel Corporation for a preliminary hearing for a request to build a similar dam from the Canadian side. The two companies each propose to build a dam from its own side of the international boundary, and these will meet in the centre to form one project. The whole will result in a considerable diversion of water, and further hearings will be held in Sault Ste. Marie, to enable local objections to the scheme to be heard.

Chertsey.—The B. of T. has asked the R.D.C. if it has any objection to the revocation of the extension order of the Woking Electric Supply Co., so far as it relates to the parish of Thorpe, owing to the powers granted not having been exercised. The Council has no objection to the revocation.

Continental Notes.—Germany.—Further utilisation of Bavarian water reserves is in contemplation. The Bayerischen Stickstaffwerken A.G. (Nitrogen Co.), located in Trostberg, and a Bavarian financial group, have secured a preliminary concession empowering them to make surveys with a view to utilising the last section of waterfalls on the Alz River between the Tacherting weir and the watermeet of the Alz and Salzach Rivers, where some 60,000 h.p. may be developed. This scheme was considered some years ago by the Badische Analin und Sodafabrik, of Ludwigshafen, but was relinquished on account of the attendant cost of requiring ground and other incidental expenses. The present scheme is practically a revival of the former one, with the difference that the river will be utilised in two sections. The upper section will be developed by the Bayerische Co., which has for some years worked the falls situated between Altenmarkt and Tacherting for the supply of current to its factories located in Trostberg and Tacherting, where the Frank Carosch process for the production of manures, nitrate of lime and sulphuric acid, is carried on. The present hydro-electric scheme is necessitated by this projected enlargement of the firm's works. The remainder of the falls between Hirten and Hölzfeld will be utilised by the financial group before-mentioned for electro-thermic, electrochemical and chemical purposes.—*Zeit. für des Gesamte Turbinenwesen.*

Turkey.—Good progress is being made with the construction of the new central electricity station in Constantinople, and it is hoped soon to commence the supply of current to private consumers. The work of electrifying the tramway system is also well in hand, and it is expected that it will again be opened for traffic by the end of the year.

France.—A new central electricity station, which will supply current for lighting and power purposes in the Departments of the Somme and La Seine Inferieure, and for the operation of the electric tramway between Eu and Treport, has just been completed by the Société d'Electricité de Ricardie.

La Société des Acieries de Trignac et de Caen is contemplating the installation of a number of electric furnaces for refining steel.

Denmark.—The Swedish Government has granted permission for supplying electricity to a large part of Seeland from the waterfalls of Halland, *viâ* Helsingborg, through submarine cables laid under the Sound to Elsinore.

Austria.—The municipal authorities of Marburg, Styria, have secured a concession to utilise the water power of the River Drau in the generation of electrical energy for lighting and power purposes. It is stated that about 20,000 H.P. is available.

A large new electricity-generating station is at present being constructed near Zillingdorf, in conjunction with the lignite mines of the Braunkohlen Gesellschaft. At present only two 8,000-H.P. steam turbines and generators, built by the Brunner Maschinenfabrik Gesellschaft, of Brunn, are being installed, but provision is being made for doubling the capacity as the demand increases. The current will be transmitted to Vienna at a pressure of 35,000 volts, and first stepped down to 6,500 volts, a further reduction in voltage to that required for lighting and power purposes in the Austrian capital being made at sub-transformer stations.

Spain.—An Electrical Exhibition.—The muncipal authorities of Barcelona have voted a credit of £40,000 towards the cost of organising the International Electrical Exhibition, which is to be held in that city in 1915.

La Sociedad Hidroelectrica del Genil is the name of a new company, which has just been formed in Cordoba, with a capital of £120,000, to acquire the 1,500-H P. generating station already established on the River Genil and the concession for the supply of electrical energy for lighting and power purposes in the principal towns in the provinces of Seville and Cordoba. The plant is to be extended to a capacity of 5,000 H.P., the contract for the supply of the necessary machinery having been placed with the Allmanna Svenska Co., of Madrid.

Dudley.—The Electrical Undertaking Sale.—A meeting of the local Traders' Association was held last week, at which a letter was received from the town clerk in reference to the proposed sale of the Corporation's electrical undertaking. The Association, the town clerk stated, was now the only opponent of the sale. The Corporation was now in communication with the B. of T., and he asked, on behalf of the Electrical Committee, that the opposition be withdrawn, thus avoiding the town being put to the great cost which an inquiry would involve. After discussion, a resolution was adopted agreeing to withdraw all opposition, but expressing the opinion that the Association had been fully justified in the action it had taken.

Workhouse Lighting.—The B. of G. has decided to consult an expert respecting the proposed lighting of the workhouse by electricity.

Eccles.—Application having been made by the managements of local places of amusement for a revision of the terms of supply of electricity, the Corporation has resolved that supplies be given at the present terms, at the flat rate of 4d. per unit, on the total amount consumed, or, in the alternative, at a fixed charge of £7 per KW. of the maximum rate of supply demanded, plus 1½d. per unit consumed at the option of the consumer.

Edinburgh.—Future Extensions.—While the necessity for an addition to the Corporation generating plant is admitted, the question has arisen among the members of the Electric Lighting Committee as to whether extensions should be carried out on the vacant ground at M'Donald Road station, or whether a new station should be erected. The Committee is also considering whether, if a new station is decided on, it should not be erected near the sea, so that a plentiful supply of water could be readily obtained. Sir Alex. Kennedy has prepared a preliminary report on the matter, and a sub-Committee will now go into the merits of the whole question.

A proposal has been made to supply direct current in Portobello, but the city electrical engineer reports that the probable demand for electricity does not justify the expenditure.

Erith.—The gross profit for the last year's working of the electricity department was £8,473, and the net profit £1,524. The output sold was 2,477,590 units, as against 2,007,699 in the previous year. The results obtained from fixed-price lighting in connection with 31 houses which had been wired and fitted up, are stated to be quite satisfactory.

Galashiels.—The Galashiels and District Electric Supply Co. has been formed with a capital of £30,000. The directors include Mr. George Balfour, London. A prov. order is to be applied for, and a site with water supply has been secured at Netherdale Haugh, close to the railway. The power station will be equipped with plant having a capacity of 1,400 H.P., and the buildings are to be sufficient to accommodate plant of a capacity of 4,000 H.P. It is calculated that the company will begin with from 600 to 800 connections. Various mills are expected to purchase all their power. Mr. Kenneth Sanderson, Edinburgh, is secretary to the new company.

Glasgow.—The Electricity Committee is purchasing stokers from the American Engineering Co. Mr. Lackie, the Corporation engineer, saw this type of stoker during his recent visit to America, and one pair of boilers will be equipped, at a cost of £1,400, on the understanding that if the stokers do not prove satisfactory the company is to remove them free of cost.

Greetland (near Halifax).—Public Lighting.—A ratepayers' meeting has been called at Upper Greetland to consider the public lighting of the town. Proposals for both electric and gas lighting will be submitted.

Grimsby.—The Public Lighting Committee has recommended the extension of the supply mains in Wellington Street, at a cost of £1,000.

Halifax.—The Tramways and Electricity Committee has decided that on and after the end of December quarter, 1913, the charges for the supply of electricity for lighting purposes within the borough be as follows:—Accounts up to 1,200 units per quarter, 4d. per unit, current in excess of 1,200 units per quarter 2d., and that a discount of 5 per cent. be allowed on all accounts if paid within the prescribed time.

Japan.—The establishment of a second power plant to serve Taihoku (Formosa) is contemplated, partly as a reserve against interruption of the original plant by floods and partly to provide for the continually increasing use of electricity in the vicinity; the cost is estimated at £25,500.—*Board of Trade Journal.*

The construction of the hydro-electric generating station which is being established by the Inawashiro Water Power Co. is making steady progress, and the plant is expected to be completed about the middle of next year. It is stated that the Tokio Electric Light Co. has already contracted to take 10,000 H.P. for 10 years from the new station, and that the Government railway authorities, in view of the electrification of the Itaya Pass section of the Oshu main line, have also contracted for the supply of the necessary electrical energy.

A new company is in course of formation with a capital of £700,000, and the title of Lake Biwa Water Power Co., to establish a plant to utilise the water power of the upper reaches of the River Ujigawa. It is said that 20,000 H.P. will be transmitted for power purposes in the city of Osaka.

Kenilworth.—The T.C. has adopted a recommendation not to apply for a prov. order for electric supply, but to advise it upon the negotiations with the Midland Electric Co., it has appointed Mr. J. C. Baudry, of Edgbaston, as consulting electrician, provided a suitable fee can be arranged.

Leicester.—L.G.B. Inquiry.—An inquiry was held on October 24th into the application of the Corporation to borrow £52,350 for additional plant. The Inspector, Mr. H. R. Hooper, took exception to the arrangement of keeping separate capital accounts for the Aylestone and Lero power stations, and suggested that one capital account should serve for both. There was a balance of some thousands sanctioned for mains at Aylestone, and they were now asking for £17,000 for mains for the Lero station. The tramways should in future be looked on as a consumer, and both stations be regarded as one. He further warned them that the Board would never sanction a further loan until the outstanding loan on obsolete plant at Aylestone had been paid off; he suggested that this should be possible in two years' time.

The T.C. is seeking powers to extend the area of supply for electricity, so as to include the parishes of Birstall, Humberstone, Evington Oadby and New Parks.

Llanfairfechan.—E.L. Scheme.—The U.D.C. has decided to apply for a prov. order for electric supply in the district, the scheme being estimated to cost £5,500. It is proposed to light the chief streets by electricity.

London.—St. Pancras.—Up-to-date flame arc lamps are to be substituted for the present mode of lighting in Hampstead Road and Charlton Street, at an estimated cost of £226. The Electricity Committee recommends the adoption of a scheme for supplying and maintaining outside electric arc lamps. It is proposed to make the annual maintenance charge £8 10s., £9 9s. 6d.; £10 14s. 5d., £11 18s. 1d., and £13 1s. 10d. for one 10-ampere arc lamp (equal to three high-pressure gas lamps of the usual C P.), burning six days a week from dusk until 8, 8.30, 9, 9.30 and 10 o'clock respectively. Beyond these hours will be charged at 2½d. per lamp per hour. In cases where consumers desire a less number of arc lamps than four hours in series, high-power incandescent lamps are to be adopted, with maintenance charges at the rate of £7 10s., £8 12s. 6d., £10, £11 5s. and £12 15s. per lamp per annum, the charge for extra burning hours being the same as above. For the purpose of comparison the Committee states that the cost of three high-pressure gas lamps is usually £20 per annum, only allowing for 800 hours' burning.

Poplar.—The 5 per cent. allowance made to the electricity department in respect of the management of public lighting, is, in future, to be calculated yearly on the savings effected on the sum of £2,663 for cost of maintenance, exclusive of current.

Hackney.—Loan Sanctions.—The Finance Committee of the L.C.C. has recommended the Council to sanction the borrowing by the B.C. of £56,748 for the purpose of the electricity undertaking, £31,150 is for mains, £16,350 for plant and £6,532 for buildings.

Hampstead.—The B.C. has decided to let out cooking apparatus on hire, with a view to encouraging the use of electricity.

Shoreditch.—A loan of £6,706 is to be taken up from the L.C.C. for electricity mains. The L.C.C. is to be asked to sanction the borrowing of £4,058 to cover expenditure on small mains extensions and house connections.

Battersea.—The Electricity Committee reports having had under consideration for some time past the question of wiring and fitting up of the premises of the Council's present and prospective consumers under the provisions of the L.C.C. (General Powers) Act, 1906. It also had under consideration a scheme submitted by the electrical engineer for the provision, fixing and maintenance of arc and metal lamps and supply of the necessary current at an inclusive charge per annum, for outside lighting. Under this scheme it is proposed at the commencement to undertake wiring work through contractors, the electricity department dealing with the supply of apparatus and maintenance work, and with minor cases of wiring which

could not be tendered for conveniently. The Committee recommends that the scheme prepared by the engineer be approved and adopted at an expenditure not exceeding £500. The Highways Committee reports having had under consideration a scheme of the Electricity Committee for lighting by electricity the streets in the Borough where electric mains for street lighting are already laid and which are at present lit by gas. The lamps proposed to be installed are of the same illuminating power as those used by the Council for certain streets in Nine Elms, and the charge offered is at the rate of £2 14s. 6d. per lamp per annum—2s. 6d. of the charge representing repayment of cost of installation. Before submitting a recommendation to the Council involving so large a number of lamps, namely, 295, as would be affected by the conversion in all the streets in question, the Committee desires to have an opportunity of seeing how the type of lamp offered compares in illuminating power, &c., with the gas lamps which would be displaced. Under these circumstances it has adjourned the consideration of the general scheme until the present method of lighting has been compared with the lamps at Nine Elms. The proposal has resulted in a deputation of gas workers protesting against the scheme.

Loughrea.—A Committee has been formed to go into Messrs. Edmundson's offer to install electric lighting in the town. The estimated cost is about £2,000.

Lytham.—The Council has decided not to take electricity in bulk from the St. Annes' Council, and it is reported that a decision has been come to to erect a generating station at Lytham. The estimated cost of plant and cables is approximately £15,000.

Maguiresbridge (Fermanagh).—Steps are about to be taken to supply the village with electricity.—*Fermanagh Times.*

Maidenhead.—Workhouse Lighting.—The B. of G. has decided to obtain alternative estimates for lighting the new workhouse laundry by electricity or gas.

Maidstone.—L.G.B. Inquiry.—An inquiry was held last week into the application of the T.C. for a loan of £6,120 for electricity purposes, including £4,646 for an engine and generator. The Town Clerk intimated that there would be an early application for another loan of £4,000 for mains and services. There was no opposition.

Manchester.—Half a Year's Progress.—The half-yearly statement shows remarkable progress. The electricity sold amounted to 53,762,108 units, or 6,614,851 more than in the corresponding period of last year. The income was approximately £216,426, an increase of £17,710. This increase is higher than the Committee, six months ago, estimated as the increase in revenue for the whole year. The quantity of electricity generated during the half-year was nearly 70,000,000 units, or 8,278,240 more than in the corresponding period of last year.

At the annual meeting of the Manchester Smoke Abatement League on October 22nd, a letter was received from Sir Charles Macara, President of the Federation of Master Cotton Spinners' and Manufacturers' Association, in which he said :—"I would have liked to have added my testimony to the value of the electrical driving of machinery. One of the mills with which I am connected in Ancoats has been driven by electricity, supplied by the Corporation, for six years, and other firms in the same neighbourhood, I understand, have followed. I am convinced that if this were generally adopted, it would add very materially to the purification of the atmosphere in that densely-populated district."

Middleton.—It is reported that the amount of electricity required by the Calico Printers' Association, and which the T.C. can now supply by reason of the arrangement with Manchester, may be two million units per annum.

Norwich.—E.H.T. Supply.—The T.C. has applied to the L.G.B. for a loan of £6,000 for mains, and for £4,000 for other purposes. The B. of T. has also been asked to consent to the laying of mains for extra-high-pressure supply and the establishment of sub-stations.

Ormskirk.—The B. of G. has decided to apply to the L.G.B. for sanction to the borrowing of £1,000 for the installation of new generator, gas engine, and water-softening plant.

Plymouth.—Loan Sanction, &c.—At a meeting of the Electricity Committee on October 24th, it was reported that the L.G.B. had sanctioned the borrowing of £5,500 for an extension of plant at the electricity works. The quarterly report of the electrical engineer showed a sale of 669,712 units, and estimated receipts £6,192, compared with 582,956 units sold and £5,653 received in the corresponding period of last year. There was an increase in the consumption of current under every head, the supply for private motors having nearly doubled in the year. At the end of the quarter there was 1,660 consumers and 113,152 lamp connections, as against 1,503 consumers and 104,985 lamp connections a year ago.

Salford.—Bulk Supply, &c.—The T.C. is to be asked to confirm an agreement for the supply to the Corporation of electrical energy in bulk by the Lancashire Electric Power Co. A resolution is also to be submitted to the Council directing that applications be made to the L.G.B. for sanction to borrow £10,500 for the purpose of affording an additional supply of energy to No. 9 dock of the Manchester Ship Canal Co., and also £3,000 for the purpose of affording a three-phase supply in the Ordsal district.

Shipston-on-Stour.—The R.D.C. has approved a draft agreement with the E.L. Co., with the addition of one clause, and the reduction of the acknowledgment fee of £1 1s. to 10s. 6d.

Southampton.—Proposed Loans.—Application is to to made to the L.G.B. for sanction to borrow £6,000, in lieu of £3,000, previously agreed to, for services, and £8,000, in lieu of £3,000, for mains ; also for sanction to borrow £1,000, for cable required in connection with the supply of current to the works of Pirelli, Ltd.

South Shields.—L.G.B. Inquiry.—An inquiry was held before Mr. T. C. Ekin on October 28th, in respect to the application of the T.C. for sanction to borrow £33,305 for the extension of plant at the electricity works. The town clerk explained that £30,000 was for the extension of the generating plant, the balance being to cover excess of expenditure on works already carried out. Notwithstanding the recent extensions, the demand on the plant has been so great that further extensions are now necessary. During the 17 years that the works had been in existence, the sum of £1,600 had been repaid to the rates, and the remainder had been carried to the reserve fund, which amounted to £12,845. In addition to the reserve fund they had reduced the capital expenditure from £191,975 to £118,597. The maximum demand upon the station had more than once exceeded the normal capacity of the plant, allowing for the proper reserve. That had been particularly the case on the direct-current side where the maximum demands had been already 1,350 KW. on the turbine, the normal capacity of which was only 1,000 KW. It was therefore proposed to install a new turbo-generator set of 2,000 KW., which would operate two generators in tandem, and two water-tube boilers, with economisers and coal conveyors, and electric circulating water pumps. Mr. H. A. Ellis, the borough electrical engineer, gave evidence in support of the town clerk's statement, and, there being no opposition, the inquiry closed.

South Wales.—Storm Damage.—A hurricane which swept through the Taff and Rhondda valleys on Monday night did considerable damage to electric power stations, and in the valley of the Aber four townships were without the usual electric supply, Bargoed in the Rhymney valley being similarly affected.

Stalybridge.—At a meeting of the Joint Board on October 23rd, the chairman replying to a vote of thanks for his services during the past year, said he was expecting the extensions at the generating station to be completed by the end of the year. They were putting one turbine down out of revenue, and they were expecting the cost would be paid out of this year's work, so that there would be no interest or sinking fund to pay.

Teignmouth.—Proposed Electric Light Scheme.—The Urban Council has received a special report from Mr. E. M. Lacey regarding a supply of electricity for the district, including Shaldon, which lies on the other side of the River Teign. Mr. Lacey advised that in the initial stages the area of supply should be confined to those portions of the district from which there would be a profitable demand—the shopping centre, hotels and the private residences on the sea front. He recommended that a portion of the district should be supplied through underground cables, and the outlying portions of the town, as well as Shaldon, by overhead wires. Dealing with the capital expenditure, Mr. Lacey estimated the work for both Teignmouth and Shaldon to cost £20,800. In the event of Shaldon having a small power station, which he did not advise, the cost would be £3,900. Mr. Lacey also gave some figures of estimated receipts and expenditure :—First year: Receipts, £2,455 ; expenditure, £2,435. Second year: Receipts, £3,320 ; expenditure, £2,715. Third year: Receipts, £4,391 ; expenditure, £2,817. For the larger district the cost would be 6d. per unit, reducing to 5d. It was decided that the members of the Council be supplied with copies of the report, and that the subject be considered at another meeting.

Torpoint.—After considering a proposed agreement for electric lighting with the E.L. Co., the U.D.C. has decided to refer the document back for the insertion of the names of the promoters of the company.

Walthamstow.—Proposed Loan.—Application is to be made to the L.G.B. for sanction to the borrowing of £2,320 for mains extensions and house services during the next three years. The question of altering the price of current supplied to the tramways department is under consideration.

Waterford.—Prov. Order.—The Corporation has decided to apply for a prov. order for the proposed electric lighting scheme.

Willesden.—The Electricity Committee has decided in future to supply all electrical contractors requiring energy solely for advertisement purposes, at the rate of 1½d. per unit. Having considered a report of the electrical engineer upon a deputation he had interviewed with reference to the practicability of introducing special charges for outside lighting to meet the competition of the Gas Light and Coke Co. in supplying, maintaining and extinguishing high candle-power lamps, the Committee states that it is unable to submit terms low enough to compete with the Gas Co.

Woodford (Essex).—The U.D.C. has deferred a recommendation in favour of a supply of electricity for the town, pending the approval of the intended prov. order by the Council.

TRAMWAY and RAILWAY NOTES

Argentina.—It is expected that the first section of the electric tube railway between the Plaza de Mayo and Plaza Once will be opened to public service towards the end of November.

The Chamber of Deputies of the Province of San Juan has sanctioned a law authorising the construction of an electric tramway line in the capital of the province.

Barnsley.—The Barnsley and District Electric Traction Co. has applied for permission from the Wombwell U.D.C. to augment its service between Barnsley and Wombwell by the addition of 15 vehicles.

Barton.—Local Tramway Rating.—At the meeting of the Guardians on the 22nd inst., the clerk was asked the figures relative to the dismissal of the appeal by the Salford Corporation against the rating of the tramways. He stated that the rate for Eccles against which the appeal was made, was £1,853, and the Salford Corporation set up a contention that it ought not to be rated at all. Since £1,853 was adopted, the valuer had increased the amount to £3,500, but that was not the subject of the appeal. The important point involved in the discussion was relative to the contention of the Salford Corporation that the Swinton and Eccles lines of tramways were to be treated as separate entities, and not held to be part of the whole system of the Salford tramways. The Barton Assessment Committee adopted the opposite contention, and that had been upheld.

The clerk stated that other unions considered the question at issue so vital to themselves that Haslingden, Blackburn, Ashton-under-Lyne, Fylde, Bury, Rochdale, Todmorden, Warrington and Salford had arranged to enter into an agreement to give the Barton Union financial co-operation. In reply to a Guardian, who asked if the rate would be increased to £3,500, the clerk said that would have to be considered by the Assessment Committee.

Birmingham.—The Tramways Committee has decided to allow "strap-hangers" to the number of six per car, before 9.30 a.m.

Bolton.—The Corporation intends to promote in the next session of Parliament a Bill, authorising, among other works, the construction of various new tramways.

Bradford.—The Tramways Committee has entered into an arrangement with the owner of premises in Forster Square to lease the property to the Corporation for a further period of five years, these premises to be used as tramway offices as at present.

The Committee has also decided to accede to the application of the Bradford Postmaster with respect to the conveyance of mails between Bradford and Shipley by tramcar.

Brazil.—About 18 months ago Messrs. Dodsworth & Co., of Rio de Janeiro, were granted the work of installing a new electric tramway and lighting system in Pernambuco, and it was arranged that Messrs. J. G. White & Co. should do the construction work. The foundation for the power house is now being built, and surveys are being made for the car barns and track, a portion of which has already been laid. The gauge is 1 m.; English cars will be used, but the power machinery and rails are all of American manufacture. The power plant will generate 4,000 H.P.—*South American Journal.*

Canada.—The Canadian Northern Railway has let a contract to the Canadian General Electric Co. for the electrification of the tunnel and the terminal beneath Mount Royal. The contract amounts to about $800,000, and calls for seven electric locomotives and eight cars for the local service. Trains are to be running within a year, and a 7-minute service is to be provided through the 4-mile tunnel.

The Canadian Pacific Railway is also making arrangements with the General Electric Co. for the electrification of the new short tunnel route over the Rocky Mountains. With the development of Canadian water-powers now proceeding, the electrification of Canadian railways is expected to proceed rapidly.

The Government has abandoned the intention of completely electrifying the Hudson Bay Railway now under construction. There are plenty of water-powers along the route, but a committee has just reported that the electrification of the route is not feasible. The grounds of this decision are not given. There is no coal in the district through which the road runs, nor, in fact, in all the North-West, except a low-grade lignite.

Castleford.—The Yorkshire (W.R.) Tramways Co. has given an undertaking to the U.D.C. that it will overhaul the track in the Castleford area, and put it in good condition, approximately about April, and in the meantime take up the Church Street track, double the track in Beancroft Road, and do really urgent repairs. The Council has accepted this undertaking.

China.—Railless Services.—The Shanghai Electric Construction Co., Ltd., is at present making some trials of railless electric traction. If these prove successful, it is proposed to start a number of services of trolley 'buses along routes which are too narrow to permit of the construction of tramways.

Continental Notes.—Austria.—The State Railway Administration has planned the utilisation of the whole of the water-power of the Stubach and its feeders, save the Odbach, for the generation of electrical energy for railway driving purposes. By the construction of storage reservoirs a constant output of some 16,000 H.P. will be attained.—*Der Elektrotechniker.*

Germany.—Good progress is being made with the adoption of electric traction on the mountain sections of the railways in Silesia. The first line, that between Konigszelt and Dittersbach, is approaching completion, and trial runs over it are expected to be made early in the new year. The next sections to be completed will be the Dittersbach-Hirchberg; Nieder Salzbrunn-Halbstadt; Ruhbank-Lieben; and Hirchberg-Grunthal. These lines are expected to be ready for operation by the spring, while several others will be opened for traffic in the autumn.

The Western section of the Great Berlin Underground Electric Railway, between Dahlem, Witbergplatz and Uhlandstrasse, has just been opened for traffic.

A number of new electric taxicabs have lately been placed in service in Berlin. They are four-wheel machines built by Messrs. Gebhardt & Harhorn, of Schoneberg.

Dublin.—The Tramway Co.'s returns to the 24th inst. show a decrease, through the strike, of £12,781. Last week the service was almost complete, but, according to the *Morning Post*, many people are still afraid to use the cars.

Edinburgh.—A petrol-electric 'bus service is to be run on the Newington route, and a garage will be erected to hold seven cars. The cost of the 'buses is estimated at £5,000, and of the garage at £1,500. A 10-minute service will be given.

Erith.—The year's working of the tramways undertaking resulted in a gross profit of £4,156; after meeting loan and interrunning charges, the net result was a deficit of £2,142, which, however, was some £847 better than in the previous year.

Glasgow.—The electors of Busby and Clarkston have decided in favour of the extension of the Corporation tramways to the Sheddens.

The Corporation is to consider a proposal for tunnelling from Gibson Street to Byres Road, for the construction of tramways.

Greenock. — Proposed Tramways Purchase. — The Corporation has received expert advice which confirms the opinion that it would be advisable, from a financial point of view, to municipalise the tramways undertaking at the present break in the lease.

Halifax. — Six Months' Working.— For the six months ended September 30th, the income from the tramways amounted to £58,147. The expenditure was £49,742, leaving a profit of £8,405. From the motor-'buses there was a loss on the six months of £240, the total income being £1,413, and the expenditure £1,653.

The Tramways Committee has decided to relay the track in several streets, at a total cost of £4,500.

Haslingden.—As a result of a conference between representatives of the Corporations of Accrington, Haslingden and Rawtenstall, it has been agreed to continue the present 10-minutes service of cars from 2 o'clock each day for one year, on condition that the Rawtenstall Corporation will forego its claim for the payment of the difference in current consumption, alleged to arise through the use of the regenerative system of control on Rawtenstall cars running through Haslingden. Councillor Waddington, at a meeting of the T.C. on October 22nd, said the arrangement was satisfactory, in that through-running would be continued, but, in the financial sense, there would be a loss. They hoped, however, if the financial loss continued to be serious, that at the end of next year the Rawtenstall representatives would meet them and let them have a time-table which would give the minimum of loss.

Japan.—Owing to the extension of the electric tramways in and around Tokio, the present output of 20,000 H.P. from the plant of the Kenagawa Water Power Co. has become insufficient to meet the requirements. As a result two new turbines and generators have just been installed, which will practically double the company's plant capacity.

An application has been made to the Tokio Prefectural authorities for a concession to construct and work an electric elevated mono-rail tramway between Neno and Asakusa, a distance of nearly two miles. The scheme has been drawn up by Mr. Okuyama Masaysu, who has recently returned from Europe, where he made an investigation into various systems of electric traction.

Leeds.—Two Corporation tramcars were in collision last Saturday morning, owing to the mist. Near Kirkstall Abbey a car ran into the back of a dray belonging to the Leeds Co-operative Society, and the driver was knocked under the dray; while in York Road, also, a car collided with a coal cart

Leicester.—The Tramways Committee has recommended the Council to purchase 10 new tramcars, at an estimated cost of £7,000.

London.—Stepney.—The B.C. has consented to the proposed extension of the tramways from the Aldgate terminus to a point near Mark Lane Station.

Proposed Crystal Palace Tube.—The Lord Mayor, in a letter to the Camberwell B.C. on the subject of the acquisition of the Palace, stated that the Underground Railways Co. was prepared to continue the present tube railway from the Elephant and Castle through Dulwich and Sydenham to the Norwood end of the Palace, provided it was supported by the districts concerned.

Manchester.—A committee has been formed to try to bring about improvements which will give "a better Manchester." Amongst suggestions issued to municipal candidates last week by the committee were the following relating to the tramways:—(1) Transfer tickets, which would lessen congestion in the central districts; (2) allow district nurses free; (3) inner circle of cars or motor-'buses running in both directions, thus connecting all the railway stations; (4) all stopping places to be lighted up at night, and the signs "Inward" and "Outward" replaced by the actual destination; (5) sign "Full" on all cars, controllable by the guard, but showing the sign above the driver's head; (6) shelters at every terminus, and *en route*, where there are important stages and crowds congregate, combined with lavatories where practicable; and (7) abolish all standing inside cars.

Mr. McElroy, general manager of the tramway undertaking, holds out no hope in reference to the suggestions for the issue of monthly or quarterly contract tickets and transfer tickets; for the running of through cars to Salford; for the establishment of an inner circle service to connect the railway stations; and for the introduction of first-class cars. His Committee, he said, was not in favour of allowing district nurses to travel free. As to the protection of drivers in inclement weather, the Committee had been experimenting for years, but some people, including drivers themselves, thought glass vestibules impaired their vision and hearing. The suggestion that a sign "Full" should be operated on every car by the guard, Mr. McElroy said, had been tried in many places, and had proved useless, because the guard could not be on the platform all the time. The Committee had decided that cars should be equipped with numbers 9 in. high, and that small hand-maps should be issued showing routes traversed, and giving the key to the route numbers. More shelters were also to be erected. The night service, which would be extended on Saturday nights to 12.30, would be continued till Christmas, when the analysis of passenger returns would be considered. The Committee proposed to supply guides in the shape of small hand-maps of the system in each car and shelter; these guides would show the routes traversed, and would indicate the starting and finishing times on each route. Regarding standing in cars, the Committee was now considering the whole question of how to meet the requirements of the travelling public. In the first six months of this year, 10 million more passengers were carried than in the corresponding period of last year, and they had to devise a system for meeting not only the requirements of to-day, but those of the future. Mr. McElroy added that his report on his observations in America and on the Continent would be issued two or three months hence.

Newport (Mon.).—The Tramways Committee is asking the Works Committee for its views upon the suggestion that the latter should bear a proportion of the cost of the paving of the tramway permanent way, on the ground that the roadway is not worn by the tramcars.

Shipley.—The D.C. has decided to complete the reconstruction of the tramway along Keighley Road, and is prepared to receive tenders for the laying of a double track from the Branch Hotel to Saltaire.

South Africa.—The Pietermaritzburg Corporation does not propose at present to take any further action regarding the railless tramways. The Corporation has, however, ordered a 40-H.P. petrol-electric char-à-banc, which will be used to test the traffic value of various routes in and about the city.—*Board of Trade Journal.*

South Shields.—At a meeting of the T.C. on October 22nd, the tramways manager presented a special report on the proposed extension of the tramways to Harton. The distance from the Market Place, South Shields, to Harton Nook, was 2·38 miles. The approximate cost would be:—Track, £12,600; overhead equipment, £1,350; contingencies (at 5 per cent.), £700; total, £14,650. The Tramways Committee recommended the adoption of the report. Ald. Hilton moved that the consideration of the subject be deferred until Harton was incorporated in the borough. He said there was only a population of 800, and he believed that there would be a loss of some £17,000 on the extension. Mr. A. D. Johnston seconded the report, saying that tramways had reached high-water mark, and that the motor-'bus was the vehicle that was now preferred by the experts. Ald. Wylie, who had moved the Committee's report, said that if the Corporation did not do something to get the increasing population to go to the outskirts of the town it would probably be faced with a big housing scheme. The amendment was adopted.

TELEGRAPH and TELEPHONE NOTES.

Anglo-French Telephony.—New telephone rates between England and France, in most cases half the present rates, will come into force to-morrow. The London-Paris rate for three minutes' conversation will be 4s.

Australia.—The amount of the tender of the Australasian Wireless, Ltd., for the wireless installation at Fremantle has been increased to £4,600.—*British Australasian.*

Canada.—The Marconi Wireless Telegraph Co., of Canada, has completed its contract with the Canadian Government, and will erect three additional stations during the next year. There are now about 32 stations at work in Newfoundland. High-power stations are to be erected at Hudson Bay and Le Pas, Manitoba.

International Time Congress.—Last week the Congress met at the Paris Observatory and unanimously approved the International Convention for the creation of an International Time Association, with its headquarters in Paris, and the regulations connected therewith. The Governments of 15 countries were represented at the Conference.

International Wireless Commission.—As briefly mentioned in our last issue, a meeting was held in Brussels at the commencement of last month at which the question of organising an International Commission to carry out wireless experiments was discussed. At the International Time Conference in Paris last year a series of resolutions was passed with reference to the formation of an International organisation for the scientific study of Hertzian waves and their relationship to the medium through which they travel; at this Conference Mr. R. Goldschmidt, of Brussels, placed his high-power station at Brussels and the sum of £1,000 for preliminary studies at the disposal of the proposed International Commission.

Arising out of these resolutions the representatives of the different countries who were present at Brussels last month drafted a provisional constitution for the International Commission and a scheme for its work.

The objects of the Commission are:—To carry out experiments on the propagation of electric waves; to make wireless telegraph measurements, and to study the problems related thereto.

The provisional programme of the work of the Commission will consist in making measurements in different countries, at different distances and in different directions, of the strength of signals sent out from the station at Brussels. These measurements will be repeated from day to day, or hour to hour as necessary in order to determine the variation of the strength of the signals with time, with distance and with direction, and later the effects of wave-length and decrement will be studied.

It is proposed to set up a receiving station near the transmitting station in Brussels in order accurately to control the strength of the waves sent out, so that an allowance can be made for any unavoidable variation, in reducing the final results.

The organisation consists of a number of National Committees, one in each of the countries taking part. The National Committees will send delegates to the International Commission, and these delegates, together with the officers, will constitute the Commission. It is proposed that the International Commission should meet once a year, or more often if the work is sufficiently advanced.

The Institution of Electrical Engineers has decided to undertake the formation of the National Committee for Great Britain, under the scheme for the organisation and encouragement of electrical research which was announced at the Institution meeting on December 12th last.

In the first instance, a sum of £2,000 presented by Mr. Robert Goldschmidt will be available to meet working expenses, and afterwards the National Committees will provide the necessary funds. Mr. W. Duddell is the first president, and Mr. M. Wien vice-president; Mr. Goldschmidt is the general secretary.

The test signals will be sent out on Mondays, Wednesdays and Fridays, at 11.25 a.m. and 3.25 p.m., starting from January 1st, 1914, with a wave-length of 3,300 m, and will consist of the letter V for one minute; this will be followed by 10 dots and spaces of one second each, a space of 10 seconds, a dash of 10 seconds, and a space of 20 seconds, the cycle being repeated three times.

New Cable.—A new cable 2,280 nautical miles in length is to be laid between Aden and Colombo by the Eastern Telegraph Co., bringing the aggregate length of that company's cables up to 110,367 nautical miles, in addition to 6,200 miles of landline.

Post Office Telephone and Telegraph Society of London.—In succession to the Telephone Society of London, which was formed under the auspices of the National Telephone Co., the Society above named has been formed, with the Postmaster-General as President, and the opening meeting of the 1913-14 session was held on Monday last at the Institution of Electrical Engineers, Sir Alex. King presiding. The chairman of the Society, Mr. Alex. Moir, superintending engineer of the London Engineering District, read a paper on some features of the district, in the course of which he gave the following forecast of the telephonic requirements of London, based upon a complete survey which has just been completed:—

	Lines.	*Stations.*
1913	130,000	222,000
1921	267,000	432,000
1928	414,000	680,000

During the past year 102,000 miles of underground wire have been provided to replace overhead wires which have been taken down.

Wireless on Board Ship.—An International Conference on Safety of Life at Sea will meet in London on November 12th, at which, amongst other questions, regulations for the use of wireless telegraphy on board ship will be considered.

Wireless Rescue.—Last week news arrived of another vessel, the ss. *Templemore*, which caught fire in mid-Atlantic, and summoned help by Marconi wireless telegraphy, on September 29th. The ss. *Arcadia* received the call, and rescued the crew, who had been compelled to take to the boats in a heavy sea.

United States.—It is reported that legal action is about to be taken with a view to setting aside the sale of the United Wireless Co.'s assets to the Marconi Co.

THE ELECTRIC VEHICLE IN ENGLAND.

In a recent issue of the Electrical Review* we illustrated a number of electrical vehicles of the commercial type, with a view more particularly of showing the wide sphere of activity which has been secured for the electric truck in the States, and which is to a large extent open to such vehicles in this country also.

While by comparison we have but little to show in this direction, yet there are unmistakeable signs that the commercial electrical vehicle will shortly enter into competition with the various types of road vehicle commonly used at the present time in this country for goods transport.

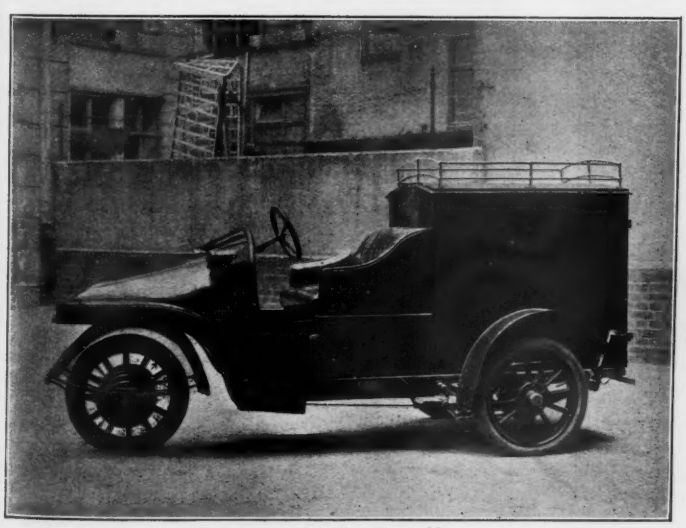
Much the same may be said as regards the electric carriage or vehicle of the pleasure type, for while in London many excellent vehicles of this class have been in use for years, they have obviously a much wider sphere of use than is the case now, both in London and the provincial cities. In this connection, the recent announcement of the Electric Vehicle Committee of the Municipal Electrical Association (Elec. Rev., September 26th) may be taken as an indication that a certain amount of organised co-operative effort will be brought to bear on this class of business in the near future.

It is, moreover, satisfactory to know that there are central station engineers sufficiently energetic to take the matter up practically and on their own account. For instance, Mr. J. W. Beauchamp, who controls the West Ham electricity department, has recently brought about the sale of two Edison trucks for use in his district, one of them being for the Stratford Co-operative Society, of two tons capacity, and to travel 35 to 45 miles on one charge.

There are also in his area, four Cedes electric ambulances in regular use in the Dock district under the control of the Port of London Authority, and a heavy electric truck in use by the Silvertown Co., of their own make, for carrying cable, &c.

Electric Dock Ambulance by the Cedes Co.

Cedes Electric "First-Aid" Car, London Fire Brigade.



Torpedo Electric Delivery Van.

These vehicles are mainly charged from the Corporation's charging stations which have been established in Canning Town and Stratford.

In order to interest possible users, the West Ham electricity department has issued pamphlets, undertaken suitable advertising, and specially instructed some of its power representatives in methods of obtaining this class of business.

A large number of demonstration journeys have been arranged in the district, which it is almost needless to say offers considerable scope for the heavy electrical carrier.

Our readers are probably aware that the Glasgow Corporation has a 1-ton electric delivery van in use, some particulars of which were given at the last Municipal Electrical Convention, by Mr. W. W. Lackie, the city electrical engineer; the Blackburn Corporation electricity department is also using an electric roadster car.

If only they were popularly recognised as "electrical," the handy little ambulances used by the City Corporation and recently adopted by the Port of London Authority, also the numerous electrically-driven appliances of the London Fire Brigade, would be an excellent advertisement for the electric battery vehicle.

The present City ambulances were supplied by the Electromobile Co., a concern which was established in 1902 for the sale of electric carriages, &c., and to whom all credit is due for the considerable measure of popularity which these vehicles have achieved in the metropolis.

In 1902 the Electromobile Co. commenced hiring out its vehicles, and at the present time over a hundred hired electric vehicles are in constant service, the company having 130 carriages in use for this purpose, while it has also supplied a number of light delivery vans.

The features of the Electromobile carriage are the straight chassis and underslung interchangeable battery, which is

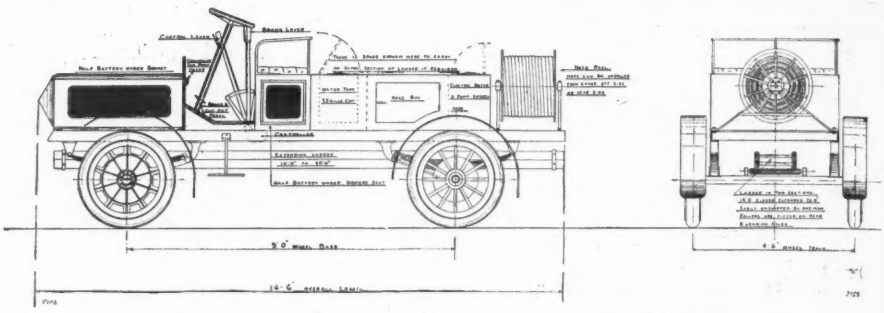
*Electrical Review, October 3rd.

sufficient for a 45-mile run; an 8-H.P. motor, capable of giving 16 H.P. for short periods, is fitted, and the control provides for speeds of 3 to 20 M.P.H.

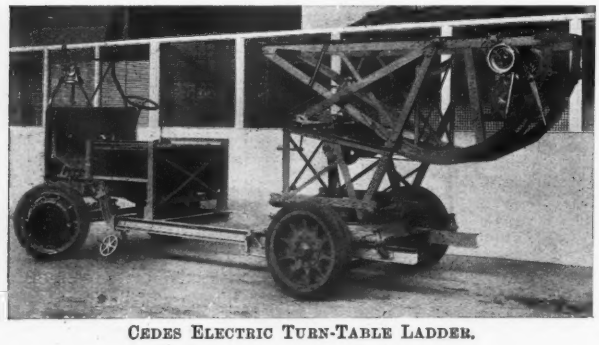
In view of the company's experience, it will be gathered that there is nothing experimental about its methods.

A good many electric vehicles for special purposes, of the Cedes type, are in use in the London area, some of which we illustrate; the Port of London Authority ambulances supplied by the Cedes Co., which are typical, weigh two tons with driver, nurse and two patients; they have a speed of 20 M.P.H. and run from 40 to 45 miles on one charge.

The special feature of the Cedes vehicle is the driving motor arrangement, the motors being fitted in the hubs of either front or back wheels, thus giving a direct and noiseless drive which dispenses with all gearing.



CEDES ELECTRIC FIRE BRIGADE CAR FOR PROVINCIAL USE.



CEDES ELECTRIC TURN-TABLE LADDER.

The ambulances are fitted with two 5-H.P. motors and to fully charge the battery requires 27 units, giving an energy cost per mile (at 1d. per unit) of slightly over ½d.

A special Tudor battery is used, the maintenance of which can be guaranteed.

The Cedes Co. has constructed a good many electric vehicles for fire brigade purposes, and we illustrate a "first-aid" car, one of 12, supplied to the London Fire Brigade.

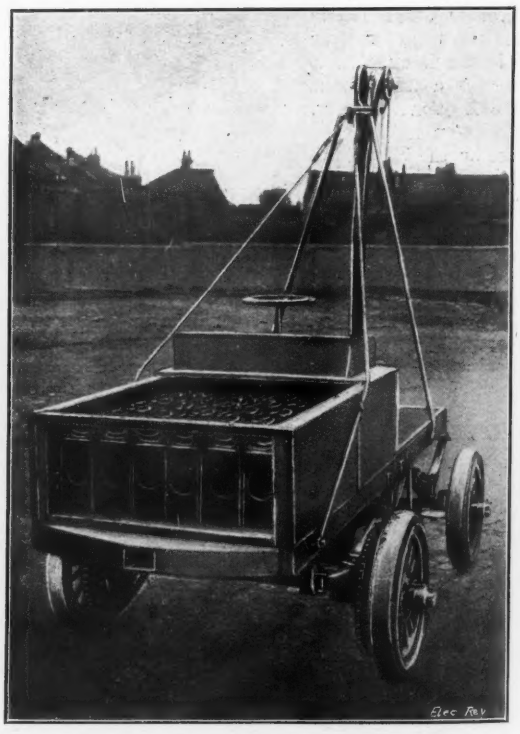
ELECTRIC YARD CRANE, B.T.H. WORKS.

These have been in use, night and day, for 2½ years, and have only required nominal repairs. The car weighs over 5 tons, has a tested speed on the level of 27 miles an hour, and a length of run with one charge of 45 miles. These cars have established a record in speed of getting away from a station, 8 to 10 seconds being the time usually required to get clear of the station, after the alarm has rung. Another view shows a Cedes electric "turn-table" ladder, several of which are in use in London; these vehicles weigh 6 tons, can run at 25 miles per hour on the level, and have a radius of action of 35 to 40 miles. The 90-ft. ladder is extended by means of a small electric motor fixed at the base, and supplied from the battery which drives the vehicle; this operation occupies 10 seconds, and the motor forms an electric brake while the ladder is being lowered.

A new type of electric fire brigade car, designed by the same firm for use in provincial centres, is illustrated above; it has a speed of 24 miles per hour and an effective travel, on one charge, of 50 miles.

The battery which drives the vehicle also drives a small motor directly coupled to a pump, for first-aid purposes; the vehicle also carries 120 ft. of hose on a reel, 300 ft. of spare hose, a first-aid equipment, a 25-gallon water tank and a 30-ft. telescopic ladder. The whole equipment weighs 2 tons, and two men can look after it, as compared with a crew of four usually required with a petrol-driven "first-aid" car.

Turning to the commercial types of vehicle in use in this country, we recently illustrated and described* a 10-cwt.



YARD CRANE, SHOWING EDISON BATTERY.

Silvertown truck for post office purposes, constructed by the India-Rubber, Gutta-Percha and Telegraph Works Co., which

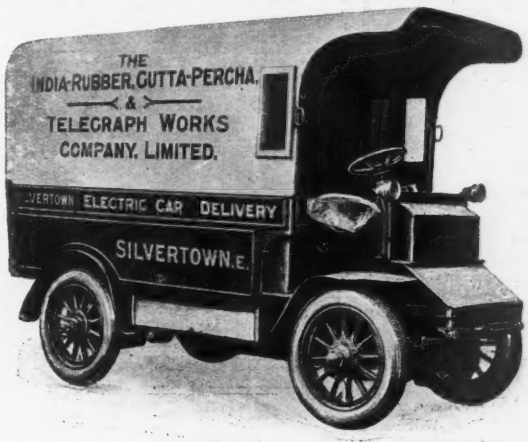
* ELECTRICAL REVIEW, August 29th, page 342.

has taken up the construction of the electric truck. We illustrate on this page a 1-ton van by the same firm, a special point of which is that both the front and rear wheels are driven by electric motors, and the controller mechanism is so arranged that either the front or back axle motor or both of them can be used, when all four wheels will be driven.

The motors are clipped on to the tubular casing of the front and rear axles and are bolted to the side of the differential case; owing to the steering movement of the front wheels, universal joints connect the driving axles therewith. One mechanical brake only is fitted on the rear wheels, and its application cuts out the current supply to the motor in such a way as to necessitate returning the control lever to the neutral position before the vehicle can be again started. A series-parallel speed control is provided, and the battery is carried in a crate slung under the frame, and can be easily detached. A safety plug is provided which can be withdrawn by the driver leaving the car and subsequently replaced, but only with the switch open.

The same plug is used in another position if the battery is being charged *in situ*, and in that case cuts out the controller.

As our readers are aware, those responsible for the exploitation of the Edison battery in this country have already entered on a vigorous campaign on behalf of the battery-driven vehicle. Through the courtesy of Mr. J. F. Monnot, who controls the Edison battery interests in this country, we are able to illustrate the demonstration vehicles which his firm is employing, these being representative of both the commercial and so-called pleasure types. We understand that the firm has in hand a good many schemes involving the use of Edison accumulator traction, and at the present time the Arrol-Johnston Co., in conjunction with the above firm, is building 50 three-passenger coupés, equipped with Edison batteries, the first portion of the 1,200 which it is the firm's intention to construct. One of our views shows a coupé of the type referred to, which recently made a successful demonstration trip from Dumfries to London, a distance of 360 miles, charging when necessary *en route*; we understand that this vehicle will be shown by the Arrol-Johnston Co. at the forthcoming Olympia Show. At the present time Messrs. Harrods are using four 1-ton Walker-Edison delivery vans, while Messrs. Liberty have a ½-ton Detroit-Edison delivery van, capable of a speed of up to 16 M.P.H., and 50 to 60 miles run on one charge.



1-Ton Silvertown Electric Truck.

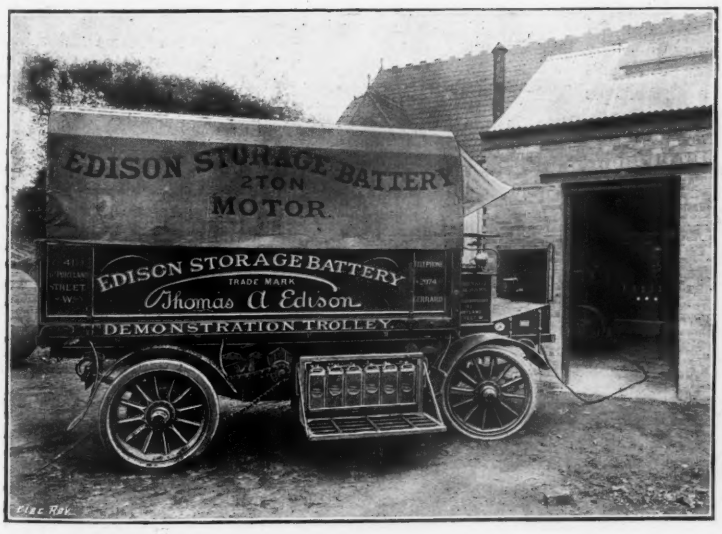
1-Ton Electric Delivery Van, Glasgow Corporation E.L. Department.

In both these cases the charging of the batteries is carried out by the firms in question, who, we understand, are likely to extend their use of the "electric" in the near future.

Another of our views shows the 1-ton Detroit-Edison delivery van in use by the Glasgow Corporation, in regard to which Mr. W. W. Lackie, at the last Municipal Electric Convention, gave such a good account. This is equipped with an Edison 150 ampere-hour battery, but will accommodate a much larger one; the motor is a four-pole series-wound machine, and series-parallel control is provided.

The loaded vehicle will run 33 miles on an ordinary road at 10 miles an hour on one charge; it has covered 6,632 miles since March at a cost for charging current of slightly over ½d. per mile.

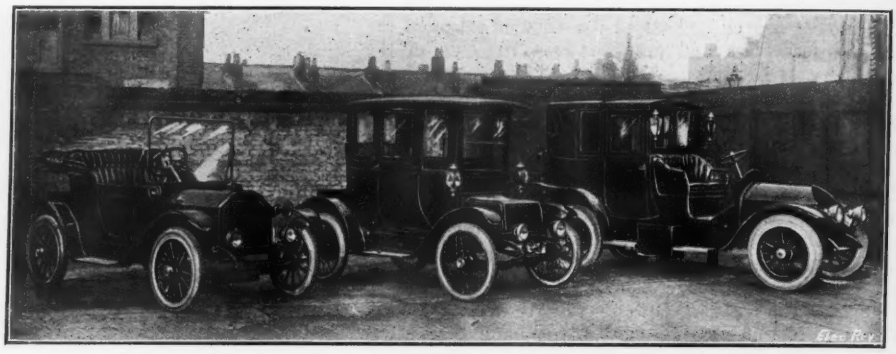
A somewhat novel form of electric vehicle, of German construction, has lately been introduced into London by the Torpedo Motor Co. We illustrate a delivery-van of this type, and it will be seen that it is mounted on three wheels



Edison Demonstration Truck at West Ham.

only, the front one being both for steering and driving, with the motor and its gearing built into the hub.

The field magnet system is rigidly fixed to the wheel hub; the armature rotates inside on a fixed axle, in the opposite direction, at five times the speed of the magnet system, being coupled to the latter by a planet gear. The current connection is through slip-rings, and speed control is provided by dividing the battery into two parts, and running on the first speed with the half batteries in parallel (40 volts), and on the top speed with the whole battery in series (80 volts). The controller is worked by the left foot and the brake by the right foot, the driver having his hands free to steer.



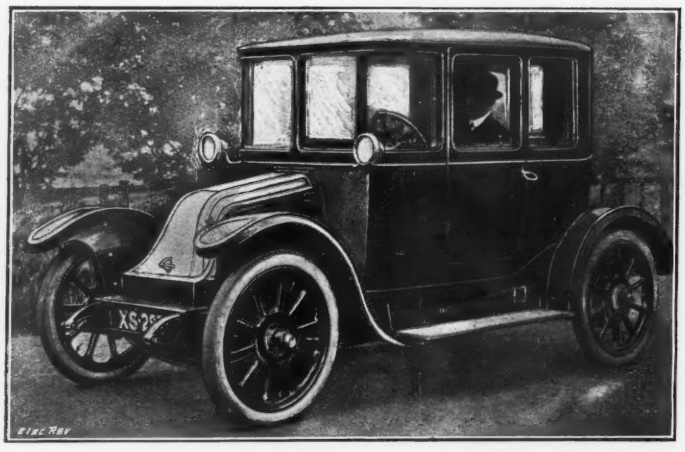
Edison "Pleasure" Type Vehicles for Demonstration Purposes.

A 10 cwt. van of this type will run some 70 miles on one charge of 16 units.

We understand that the Torpedo Co. is also introducing another type of three-wheeled electric for smaller loads, in which the driving motor is fitted above the front wheel, and geared to it through spur and bevel gearing.

Another development is a light "electric-petrol" vehicle, which will shortly be placed on the market by Messrs. F. A. Wilkinson & Partners, Ltd., of Hatfield.

This is essentially a battery car, intended for charging in the ordinary way, but a small petrol engine and special type of motor-dynamo are fitted, by means of which the battery power can be supplemented on hills, and the battery can receive an occasional charge when the car is standing.



Arrol-Johnston (Edison) Coupe.

The engine is also a safeguard in case the battery runs down and no ordinary charging facilities are available. The car is constructed on cycle car lines, with a view to obtaining a moderately-priced vehicle, and weighs only 12 cwt.; it can be used when the pure battery car would be useless owing to lack of charging facilities, and retains the simple control of the electrical vehicle.

Edison Commercial Vehicles for Demonstration Purposes.

Although at present we have only isolated examples of the commercial "electric" in this country, and the great majority of electric battery vehicles of all kinds are found in the London area, there is reason to believe that this state of affairs will be altered before long.

For one thing, numerous British engineers and business men have lately formed their own opinions of the "electric" first hand, during visits to the States; an instance of the trend of events was the announcement of Mr. B. M. Drake, of Messrs. Drake & Gorham, Ltd., at the recent annual meeting of the company, that following on a visit he made to America, his firm had made arrangements to supply electric cars forthwith, and he hoped this might soon develop into a large business.

In the course of a letter to us on the subject, Mr. Drake says:—

> Users of commercial cars informed me that apart from the greater distance covered, the actual working expenses were considerably less than with horses, and the so-called "pleasure" cars were stated to compare favourably with petrol cars, although petrol is about half the price in America that prevails here.
>
> The cars I tried were fitted with new type Edison batteries, which are rapidly coming to the front for traction work. A year ago I was told that the proportion was about one-third Edison to two-thirds lead, whereas at the present moment it is about half and half, and it is anticipated that in a year's time the proportion will be reversed.
>
> I was told that the working cost of a 5-ton commercial vehicle, including depreciation of accumulators, amounted to only 2½d. per ton-mile, and brewers have found that their costs per barrel delivered in the radius come out much lower than with horses.
>
> It is a little difficult to see why this mode of traction has succeeded in America, whereas attempts here in the past have failed; the price for current is higher in America, then her labour is about double, and there is the same competition from the petrol car, in fact, the Ford Co., whose works I visited, are turning out 1,000 cars a day.
>
> In the case of the commercial cars, I think the horses suffer considerably from the heat in summer, and the country is somewhat flatter, but probably the explanation is to be found in the support given by the supply companies to this industry, several of them having erected large garages at their own expense, where cars of

all kinds are sent after the day's work and fetched next day ready for use. They have also "boosting" facilities at different parts of the towns where an Edison car can be charged up while the owner is shopping or having lunch, and thus one of the drawbacks to the electric car, viz., its short running power, is obviated at any rate for town use.

My opinion is that the commercial vehicle will come into immediate use in England for delivery and haulage wherever the roads are good, and I think the "pleasure" vehicles will follow later when charging facilities throughout the country have been arranged. At present they are practically useless for touring purposes, but the moment one can recharge with little more trouble than is necessary to empty a tin of petrol, there is no doubt that the absence of smell and noise, the perfect control, and other advantages of the electric vehicle, will bring it into general use, especially as the tendency for the price of electricity is to go down, whereas that of petrol is bound to go up.

Compared with the petrol-driven machine at the present time, the first cost of the electrical vehicle is undoubtedly high—a fact which has not escaped the notice of the American central-station authorities, who still retain many non-electrical vehicles in service.

Although this may be a small matter for wealthy individuals and companies with ample capital behind them, it is obvious that however low the running and maintenance costs of the "electric," and this is not disputed, the first cost is likely to delay its adoption in very many cases, unless hire and hire-purchase schemes on a large scale can be evolved.

A case in point is the small tradesman who, although unable to purchase outright, would undoubtedly benefit more by the use of the handy electric delivery van, than by using either a petrol or horsed vehicle.

Contract arrangements on a mileage or other basis are meeting with success in the case of the petrol vehicle, and there appears to be no reason why they should not be adopted at the outset in connection with the "electric."

We are aware that this matter has received consideration, but rather with a view to demonstrating the advantages of the "electric" than of meeting the objection of its first cost. However, there is little doubt that, now that practical interest in the subject has been aroused, those who have determined to push the electric vehicle to the front will not rest until adequate means have been found not only for introducing it, but also for securing its adoption wherever possible.

CONTRACTS OPEN and CLOSED.

OPEN.

Aldershot.—November 4th. Coal (800 tons) for the U.D.C. electricity works. Mr. F. Garside, Electricity Works, Laburnum Road.

Australia.—Sydney (New South Wales).—March 18th, 1914.—For the Postmaster-General. Seven automatic switchboards. Schedule No. 179. See "Official Notices" to-day.

December 14th.—Two-sections switchboard, common-battery multiple. See "Official Notices" October 17th.

Hobart (Tas.).—December 1st. Dry cells for the P.M.G. See "Official Notices" October 17th.

Brisbane.—December 17th. P.M.G.: Insulators. See "Official Notices" to-day.

December 31st. P.M.G. Insulators. See "Official Notices" to-day.

Banbridge.—November 3rd. Lighting public streets by gas or electricity for the U.D.C. Particulars at Town Surveyor's office.

Beckenham.—November 10th. U.D.C. 12 months' supply Midland Small Coal. See "Official Notices" to-day.

Bedford.—November 12th. Corporation. (1) 1,000-kw. mixed-pressure turbo-alternator with exciter and condensing plant; (2) water-tube boiler with mechanical stoker and coal-handling plant. See "Official Notices" October 24th.

Belgium.—December 4th. Two electric passenger lifts at the new industrial school. Tenders to Burgomaster, Hotel de Ville, Antwerp. Deposit £40. Some particulars may be seen at Board of Trade, C.I. Department, in London.

Bournemouth.—November 17th. Corporation: Ten bogie electric tramcars.

Bradford.—November 15th. Electrical installation, Technical College, for the Education Committee. City Architect, Town Hall.

Bulgaria.—November 11th. The District Finance Administration, in Sofia, is inviting tenders for 2,000 metres of underground telephone cable with 40 pairs of conductors, and 80,000 metres of rubber-insulated double-conductor cable.

Canada.—Winnipeg.—Telephone line, being part of Greater Winnipeg water supply scheme. M. Peterson, City Hall, Winnipeg.

Dublin.—November 1st. G.N. Railway Co. (Ireland). One year's supply of stores, including a number of electric and telegraph supplies. See "Official Notices" October 10th.

November 17th. Twelve months' supply of stores, for Dublin Electrical Tramway Co., Ltd. See "Official Notices" to-day.

Glamorgan.—The County Council desires to negotiate for the construction and working of five miles of light railway from Ynysforgan to Pontardawe. See "Official Notices" October 10th.

Glasgow.—November 3rd. Caledonian Railway: Six months' supply of stores, including a number of electrical, telegraph and telephone items. A. J. Easton, stores superintendent, 321, Charles Street, St. Rollox, Glasgow.

Grimsby.—November 13th. Corporation: Metal-filament lamps; ½ to 15 h.p. continuous current motors; ½ to 15 h.p. motor panels; house fuse boxes and fittings; house service boxes (lead) and fittings. See "Official Notices" to-day.

India.—Allahabad.—Electric generating plant, consisting of oil engines, continuous-current dynamos and storage batteries. Hon. Sec., Allahabad Club, Ltd., Allahabad.

Leicester.—November 3rd. Corporation Tramways. 190 tons of girder tram rails and fish plates. Specifications and form of tender (2½s.) from Mr. E. G. Mawbey, Borough Surveyor, Town Hall.

London.—November 12th. L.C.C. (1) Installation at Colebrook Row Special School, Islington, N. 95 lighting points; (2) installation at County Secondary School, Chelsea, 180 lighting points. See "Official Notices" October 24th.

The L.C.C. invites persons and firms, particularly manufacturers, to have their names placed on the list of those from whom tenders for supply of stores and execution of general maintenance contracts are invited by it. See "Official Notices" October 24th.

Port of London Authority.—November 5th. Various stores including arc lamp carbons and carbon filament lamps. Stores Superintendent, 106, Fenchurch Street, London, E.C.

Battersea.—November 13th. Corporation: Installing arc lamps and metallic lanterns on consumers' premises in connection with hire scheme for one year. See "Official Notices" to-day.

New Zealand.—January 5th, 1914. The Christchurch City Council invites tenders for series street-lighting plant (1,950 metallic-filament lamps) and accessories. A specification can be seen at the B. of T. C.I. Department in London.

Oldham.—November 10th. Painting of tramway standards and section boxes.

Rathmines and Rathgar.—November 4th. The Council. One 400-kw. generating set (high-speed engine direct coupled to two d.c. dynamos in tandem). See "Official Notices" October 17th.

Rhyl.—November 19th. One 160-kw. Diesel engine set, for U.D.C. See "Official Notices" October 17th.

Spain.—November 16th.—The municipal authorities of Glebe (province of Alicante) are inviting tenders for the concession for the electric lighting of the town during a period of two years.

November 10th.—The municipal authorities of Jaen are inviting tenders for the concession for the electric lighting of the town during a period of 15 years.

The Azores.—January 12th. La Junta Generale du District de Ponta Delgada, Saint Michel, Azores, is inviting tenders for the construction and working of an electric railway between Ponta Delgada and Valle das Furnas, and between Ponta Delgada and Villa da Ribeira Grande. The lines will be laid at the side of the national and municipal roads.

Wakefield (Yorks.).—December 5th. Twelve months' supply of stores, for Yorkshire (West Riding) Electric Tramways Co., Ltd.

Wolverhampton.—November 9th. Corporation: One 4,000-kw. turbo-alternator, condensing plant, and auxiliaries.

CLOSED.

Argentina.—The Government has authorised the Post Office to purchase from Messrs. Duhnkrack, Nellen & Co. 150 tons of No. 7 galvanised iron wire for telegraph lines, at a cost of $17,197·50 m/n.—*Review of the River Plate.*

Australia.—P.M.G.'s Department, Victoria :—

90 miles wire, tinned copper, rubber insulated, cotton covered and braided, No. 22 S.W.G., £2 19s. per mile.
25 miles wire, twisted pair, tinned annealed copper, vulcanised, india-rubber insulated, taped and braided, £13 15s. per mile.—Armorduct Manufacturing Co., Ltd.—*Tenders.*

MELBOURNE CITY COUNCIL.—Insulated copper wire, Messrs. Johnson & Phillips, Ltd., £2,929.—*Tenders.*

SYDNEY.—The following tenders have been received :—Arc lamp winches :—

W. G. Watson & Co. (Verity's Aston), £168.
London Electric, size B, £235 ; size C, £277; size C, fig. 187, £437.
Warburton, Franki, Ltd., £170.
Lawrence & Hanson, Ltd., £180.
British General Electric Co., £210.
Adler Bros., £320.
A. Guthridge, Ltd., £320.

Wiring and fittings for electric supply for Chippendale Dwellings :

Lawrence & Hanson, Ltd., £578 ; alternative, £834.
Handley & Lewis, £797.
O'Donnell & Griffin, £825.
Sydney Electrical Engineering Co. (informal), £998.
W. H. Wiles, £1,071.—*Aus. Record.*

Basingstoke.—The T.C., on October 23rd, accepted the following tenders in connection with the electricity scheme :—

Coldmarsh & Hanley, Ltd.—Engines, &c., £3,917.
Hart Accumulator Co., Ltd.—Accumulators, £1,408.
Cox-Walkers, Ltd.—Main switchboard, £490.
Johnson & Phillips, Ltd.—Cables and cable laying (about 5½ miles), £3,823.
Herbert Morris & Co.—Overhead travelling crane, £114.

Belgium.—Seven concerns, five German and one each Belgian and French, submitted tenders last week to the Belgian Post and Telegraph Authorities in Brussels for the supply and laying of a quantity of telephone cables in the Malines district. The lowest offer was that of Messrs. Felten & Guilleaume, of Mulheim-am-Ruhr.

Bradford.—The Sites and Works sub-Committee of the Technical College Committee has decided to accept a tender for the completion of the electric lighting at the Technical College.

Farnworth.—The Electricity Committee has accepted the tender of Messrs. T. & C. Scowcroft for coal.

France.—The French Post and Telegraph Authorities in Paris have just placed a contract with M. Doignon, of Malakoff (Seine), for the supply of 30 Hughes telegraph transmitters.

Harrogate.—The T.C. has accepted the tender of Messrs. Stones, Ltd., of Ulverston, for a curvilinear steel revolving shutter for preventing sand and grit from entering the machinery at the electricity works, at £30.

Haslingden.—The T.C. has accepted the tender of Messrs. Siemens for the supplying and laying of the cable for the supply of electricity to the Helmshore district.

Heathfield (Sussex).—The tender of Caffyn's Garage, Ltd., of Heathfield, has been accepted for the installation of electric light at Union Church, and for the supply of current from the company's private plant.

Heywood.—The Corporation has accepted the tender of Mr. Bertram Thomas for alterations to the switchboard at the electricity works, and that of Messrs. Wm. Reay & Co. for coal as required during the ensuing six months.

Huddersfield.—The Electricity Committee, after considering the tenders received for H.T. switchboard, recommended that of Messrs. Switchgear & Cowans, Ltd., at £2,259, for acceptance. Tenders were also received from the British Westinghouse Co., Ltd., the British Thomson-Houston Co., Ltd., Messrs. Siemens Dynamo Works, Ltd., and others.

Leicester.—The Tramways and Electricity Committee of the T.C. has accepted the following tenders in connection with extensions at the electricity works :—

Siemens Bros. Dynamo Works, Ltd.—Turbo generator, with reversible rotary converters, switchgear, &c , for the Lero station, and rotary converter switchgear for Aylestone station, £20,018.
Clarke, Chapman & Co., Ltd.—Steam-raising plant, for the Lero station, £8,212.
J. Chapman & Sons, Ltd., car-repairing shops, £14,076.

London.—L.C.C.—It is recommended that the offer of Messrs. John Mowlem & Co., Ltd., for the construction, on the underground conduit system, of tramways on the bridge carrying High Street, Wandsworth, over the River Wandle and between the bridge and a point adjacent to Garrratt Lane, on the basis of an addition of 15 per cent. on the rates contained in their tender for the construction of tramways in Bromley Road, be accepted.

It is proposed to accept the tender of Messrs. Chas. Wall, Ltd., at £25,690, for the erection of the third section of the tramways central car repair depôt.

The Walsall Electrical Co., Ltd., has secured the order for the electric charging switchboard for Waterloo Road fire station.

ST. PANCRAS.—The B.C. has accepted the offer of Messrs. Heenan and Froude to supply a wet air filter for the 1,000-KW. Ljungström turbine to be installed at the King's Road station, for £160.

Luton.—The following tenders have been accepted by the T.C. for supplies to the Electricity Department :—

Tudor Accumulator Co., Ltd., traction battery of 250 cells, £1,137, less approximately £170 for existing battery.
Hudson Economiser Co. (1907), Ltd., cooling tower of 170,000 gallons capacity, £889.
J. Facer & Son, South Leicester coal, 13s. 5d. per ton.
Geo. Newbold, Whitwood coal, 13s. 9d. per ton.

Newport (Mon.).—A Committee of the T.C. has recommended the acceptance of the tender of Messrs. Heenan & Froude for a refuse destructor, at £7,967.

Salford.—The T.C. has accepted the tender of the British Westinghouse Co., Ltd., at £42 10s. for two additional potential transformers on the extra-high-tension switchboard ; also the tender of Messrs. J. Wolstenholme & Son, at £193 15s., for an additional vertical two-stage air compressor for the electricity station.

Sunderland.—Messrs. T. Reid, Ferens & Co. have secured the following installation contracts :—Sunderland : New Gaiety Theatre, Queen's Hall Kinema, Dawdon Princess Hall, Rutland Hall, South Hylton Cinema, Workhouse extensions.

Willesden.—The U.D.C. has accepted the tender of Messrs. Crompton & Co., at £713, for replacing the direct-current switchboard at the Salusbury Road sub-station.

Woolwich.—The tender of Messrs. Jno. Shelbourne and Co. has been accepted by the B.C., at £2,495, for the supply and laying of three 18-in. suction and discharge pipes a distance of 186 ft. along the river bed, and in connection with the condensing plant now in course of erection at the Globe Lane electricity works.

Worthing.—Acting on the recommendation of the Electricity Committee and the resident engineer, Mr. G. Porter, the T.C. on Tuesday decided to accept the tender of Messrs. Mirrlees, Bickerton & Day, Ltd., for a Diesel engine and generator at a total cost of £4,468, £3,785 of this sum being for the Diesel engine and the remaining £683 for a generator by Messrs. Crompton & Co.

FORTHCOMING EVENTS.

Greenock Electrical Society.—Friday, October 31st. At 7.45 p.m. At Temperance Institute, West Stewart Street. Papers on "The Principles of the Steam Engine," by Mr. J. Frew ; and "Boiler Inspection," by Mr. G. R. Reid.

Junior Institution of Engineers.—Friday, October 31st. At 39, Victoria Street, Westminster.

North-East Coast Institution of Engineers and Shipbuilders.—Friday October 31st. At 7.30 p.m. At the Literary and Philosophical Society, Westgate Road, Newcastle-upon-Tyne. Annual general meeting.

Batti-Wallahs' Society.—Friday, October 31st. At 7.45 p.m. At Holborn Restaurant. First Smoking Concert.

Salford Technical and Engineering Association.—Saturday, November 1st. At 7 p.m. At Royal Technical Institute, Peel Park. Short Papers.

Institute of Marine Engineers.—Monday, November 3rd. At 8 p.m. Presidential address, by Mr. T. L. Devitt.

North of England Institute of Mining and Mechanical Engineers.—Monday, November 3rd. At 8 p.m. At Chemical Theatre of Armstrong College. Second lecture on "Utilisation of Fuel," by Prof. J. W. Cobb.

Royal Institution of Great Britain.—Monday, November 3rd. At 5 p.m. At Albemarle Street, W. General meeting.

Society of Engineers.—Monday, November 3rd. At 7.30 p.m. At the Institution of Electrical Engineers, Victoria Embankment. Ordinary meeting.

Rontgen Society.—Tuesday, November 4th. At 8.15 p.m. At Institution of Electrical Engineers, Victoria Embankment. Presidential address, by Prof. A. W. Porter.

Institution of Electrical Engineers (Manchester Section).—Tuesday, November 4th. At 7.30. At Banqueting Hall, Midland Hotel. Address by Prof. E. W. Marchant, chairman, followed by Smoking Concert.

Institution of Civil Engineers.—Tuesday, November 4th. At 8 p.m. At Great George Street, Westminster. Address by the President, Mr. A. G. Lyster. Presentation of Medals.

Institution of Civil Engineers of Ireland.—Wednesday, November 5th. At 8 p.m. At Dawson Street, Dublin. Ordinary meeting.

Chemical Society.—Thursday, November 6th. At 8.30 p.m. At Burlington House, Piccadilly. Papers.

Institution of Electrical Engineers (Yorkshire Section).—Thursday, November 6th. At 7.15 p.m. At Hotel Metropole, Leeds. Reception. Inaugural address, by Mr. W. B. Woodhouse, chairman. Smoking concert.

Institution of Municipal Engineers.—Friday, November 7th. At 2.45 p.m. At 4, Southampton Row, W.C. Presidential address, by Mr. F. Latham. Paper on "Electricity as a By-Product," by Mr. R. J. Spencer-Phillips.

Junior Institution of Engineers.—Friday, November 7th. At 39, Victoria Street, Westminster. Paper on "Experience in the Design and Working on Different Kinds of Fuel of Gas Producers," by Mr. G. E. Lygo.

Manchester Association of Engineers.—Saturday, November 8th. At Grand Hotel, Aytoun Street. Paper on "Recent Developments in Steam Condensing Plants," by Mr. A. E. Leigh Scanes.

Male v. Female Labour.—Mr. Herbert Samuel, interviewed on his return from a tour of investigation of the telephone systems of the United States and Canada, said that in both those countries the policy was adopted, some years ago, of paying equal wages to women and men. The result had been that practically no more women had been taken into the employment of the Post Office in Canada, which was almost closed as a woman's occupation, owing to the fact that men superseded women in many respects in Post Office work. This was also the case, to some extent, in the United States.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—Lieut.-Col. H. M. Leaf.

The following orders have been issued for the current week :—

Monday, November 3rd.—"A" Company. Technical instruction, 7 to 10 p.m.

Tuesday, November 4th.—"B" Company. Ditto. A meeting of N.C.O.'s will take place at 8 p.m.

Wednesday, November 5th.—Recruits only. Infantry drill and technical instruction, 6 to 10 p.m.

Sergeants' Mess.—There will be a meeting of the members of the Sergeants' Mess in their Mess Room, at 7.30 p.m.

Thursday, November 6th.—"C" Company. Technical instruction, 7 to 10 p.m. Meeting of N.C.O.'s at 7 p.m.

Friday, November 7th.—"D" Company. Ditto.

Saturday, November 8th.—Headquarters will be opened from 10 a.m. till 12 noon for the transaction of regimental business only.

(Signed) J. H. S. Phillips, Major.
For Officer commanding L.E.E.

NOTES.

Institution and Lecture Notes.—I.E.E. (Manchester Local Section).—The following is the programme of this Section for the session, which opens on Tuesday next with the delivery of Prof. Marchant's address at the Midland Hotel, Manchester :—

First Half of Session.—November 4th, 1913.—Prof. E. W. Marchant. Chairman's address.

November 18th.—H. H. Perry. "A Two-rate Tariff System without Time-operated Control."

December 2nd.—S. Evershed. "Characteristics of Insulation Resistance, with an Appendix on Insulation Values."

December 16th.—H. C. Gunton. "Employment of Power in H.M. Post Office."

January 13th, 1914.—T. Ferguson. "Train Lighting." (Provisional.)

January 27th.—B. Welbourn. "British Practice in the Construction of High-tension Pole Lines." (Provisional.)

Second Half of Session.—Dates of meetings—February 10th and 24th, March 10th and 24th, and April 7th and 21st, 1914. Probable papers, "The Use of Reactances in A.C. Circuits"; "Electric Furnaces"; "Turbine-driven Auxiliaries"; "The Design of Traction Motors for Alternating and Continuous Currents"; "A High-duty Low-tension Cable"; "The Cascade Induction Motor"; "Experiments on Air-Blast Cooling of Transformers."

Annual dinner.—Friday, February 27th, 1914.

Salford Technical and Engineering Association.—On Saturday, November 1st, a meeting will be held at the Royal Technical Institute, when the evening will be occupied by short papers by members, in competition for a gold medal offered by Mr. W. O. Larmuth. The time allowed for the reading and demonstration of each paper is 12 minutes. Seven competitors will enter the lists. The Committee will adjudicate, the result being made known and the medal awarded at the annual meeting on December 6th.

Institution of Municipal Engineers.—On Friday next the annual general meeting of the Institution will be held at No. 4, Southampton Row, W.C., at 12 noon. In the afternoon the President will deliver an address, and several papers (taken as read) will be discussed, including one by Mr. R. J. Spencer-Phillips, on "Electricity as a By-Product." In the evening there will be a reception by the President, at which the Lord Mayor of London and the Mayors of the Metropolitan Borough Councils will be present.

Institution of Civil Engineers.—On Tuesday last week a dinner was held in the new home of the Institution ; the President, Mr. R. Elliott-Cooper, occupied the chair, and was supported by a number of distinguished members and guests.

Institution of Mining and Metallurgy.—Dr. F. H. Hatch, M.Inst.C.E., has been elected president for the year.

Association of Electrical (Station) Engineers.—A meeting of the London Section was held at Chandos Hall, Tuesday, October 28th, to discuss further the policy of the Association. A very interesting paper was read by Mr. W. E. Russell on "The Passive Policy," which was well received by those present. The supporters of this policy had most to say on this occasion, and during the discussion the fact was made clear that the passive and progressive policies were similar in all but name. Nominations were received for the various offices for the coming year, which matter will be voted on by the whole of the members. It was suggested that the social side of the Association should not be neglected in London, and the Committee hopes to make arrangements shortly for a conversazione.

Electrical Production of Steel.—A few years ago a large plant for the electrical production of steel on the Roechling-Rodenhausen system was erected at the Eich Iron and Steel Works near Leusemburg, which now belong to the Burbach-Eich-Dudelingen United Ironworks. The opinion was entertained by the directors that the plant would yield very favourable results, but it was soon ascertained that their hopes were too sanguine, and that the financial results were very unfavourable. A Esch correspondent, writing to a Frankfort newspaper, now states that a better outcome is expected in the current year, as technical improvements, which have been introduced in the manufacture of the steel, have considerably diminished the pessimistic prospects which formerly prevailed.

The "Point Fives."—A meeting of the "Point Fives" was held on October 17th, at the "B. & K." Restaurant, Earl's Court Road, S.W., at which Mr. Allen (Wolverhampton) and Mr. A. H. Shaw (Ilford) were elected members. A feature of the evening was an examination of the new type of oven and grill which has been designed by Mr. Downe, and of which 50 are being put through the company's workshops. In the opinion of the members present, the oven has distinct advantages over other designs, especially as regards weight, price, and heat and electrical insulation.

The chairman, Mr. C. S. Davidson, stated that since the introduction at Barnes of the ½d. tariff, some 10 per cent. of the consumers had elected to be charged on the rateable value basis, and they had been inundated with inquiries regarding the hire and purchase of all classes of current-consuming devices. Had the department been in possession of the necessary powers to meet the demand, he was certain that the sales of energy would have been greater, the costs would have been reduced, and the financial result expressed by a very much higher percentage of profit.

The experience gained, however, though small, was significant, and abundantly proved that no matter how low the tariff dealing with domestic supplies, great and lasting expansion could not be anticipated until the supply authorities had power to set up and maintain energetic sales and hire departments.

They found, owing to their inability to hire out cookers, that the cheaper classes of apparatus, such as radiators, were being installed in the proportion of about 100 to one cooker ; so far, therefore, as Barnes was concerned, they were selling cheap units without the anticipated advantage in diversity factor, which could only be rectified by the introduction of a low hiring rate for cookers.

It was decided to co-operate with the A.M.E.E. of London in publicity matters, and that every possible effort should be exerted to bring about a general publicity scheme for the electric supply industry.

The next meeting (January 16th, 1914) will be held at "Tricity House," provided arrangements can be made, and each member may invite one or two guests to the dinner (7 o'clock) and discussion.

Fatalities.—Wm. Donnat, electrical engineer, Stirling, was knocked down by a train while taking a short cut home over the railway, and fatally injured.

Durban.—A native in the employ of Mr. Udal, manager of Kynochs, Ltd., was recently killed electrically. At the inquest Mr. Udal stated that the light in his stables had been out of order for some time, the cause being that the wires were crossed near a tree. He therefore treated the wires as dead, and obtaining a ladder told the native to go up and shake the wires free. Deceased touched the wires with his hands and shouted. Mr. Udal switched off the current and returned to find the man had fallen on the roof. A doctor who was called in pronounced him dead. The chief electrician from the power station said the voltage was 200.

For Sale.—Messrs. Huddleston & Co. will offer for sale by auction, on November 6th, at 16, Long Millgate, Manchester, a large quantity of electrical apparatus, fittings, &c.

The West Hartlepool Corporation Tramways Department has for disposal two 125-kw. Willans-Mather & Platt's generating sets, two 65 kw. Willans-E.C.C. generating sets, steam boilers and other plant. Particulars are given in our advertisement pages.

Appointments Vacant.—Charge shift engineer at the Greenwich generating station, Tramways Department, for the L.C.C. (£250) ; a representative to interview consumers (lighting, heating, &c.) is wanted by a provincial electricity undertaking (35s.) ; electrical mechanician, for Nigerian Government, age 25-40 (£250, passage free, single quarters) ; fitter, for the Cleckheaton U.D.C. (40s.) ; commercial assistant, for Battersea B.C. electricity department (£2 +) ; assistant for Walthamstow U.D.C. Electricity Department (£150). Particulars are given in our advertisement pages.

Kelvin Memorials.—According to the *Times* a marble bust of Lord Kelvin, by Mr. Shannon, A.R.S.A., the gift of Lady Kelvin, was presented to the Royal Society of Edinburgh on Monday last by Prof. Crum Brown, on her behalf. Principal Sir William Turner, who presided over a large gathering, said Lord Kelvin had been 60 years a Fellow of the Society, and was occupying the post of President for a third term of five years when he died in 1907

Light Railways.—The Board of Trade has issued revised rules with respect to applications to the Light Railway Commissioners under the Light Railways Acts, 1896 and 1912. Copies of these rules can be purchased, either directly or through the usual agents, from Messrs. Wyman & Sons, Ltd., Fetter Lane, Fleet Street, London, E.C.

Athletics.—The "Cryolite" Athletic Association has been formed by the London staff of the British Aluminium Co., Ltd., 109, Queen Victoria Street, E.C., with divisions for football, cricket, lawn tennis and swimming.

The Batti-Wallahs.—The first smoking concert of the season will be held to-night, at the Holborn Restaurant (Council Chamber). The President, Mr. J. Snow Huddleston, will take the chair at 7.45 p.m.

Standardisation of Electric Lamps for Motor-Cars.—At a further meeting of the sub-committee of the Accessories Committee of the Society of Motor Manufacturers, appointed to deal with the question of the standardisation of electric lamps for use on motor-cars, another discussion on the subject took place, and it was finally left for the lamp manufacturers to forward to the society their conclusions as to the results of the conference.

Bankruptcy Proceedings.—The first meeting of creditors was held on Wednesday, at the London Bankruptcy Court, under a receiving order made against Mr. Sydney A. M. Rose, described as of 79, Elgin Mansions, Maida Vale. Mr. Egerton S. Grey, Official Receiver, presided.

According to the debtor's statement, he was in the Colonies for 20 years prior to 1907, and for many years acted as chief electrical engineer to Foy & Gibson, Ltd., Melbourne. He also traded in that city as an electrical engineer on his own account for a few years. In 1907 he came to England to exploit an invention for an automatic target. The Rose Automatic Syndicate, Ltd., was formed in the first instance, but that was taken over by the Rose Recording Target Co., Ltd. The latter company went into liquidation, and in January, 1912, the debtor acquired the patents from the liquidator. The Rose Automatic Target Co., Ltd., was next formed with a nominal capital of £35,000. As vendor the debtor received 14,000 fully-paid shares and £2,000 in cash, and he is now acting as technical adviser to the company at a salary of £400 per annum. In addition he has a 40 per cent. interest in the world's patents of the Reinstein Washable Brush. He roughly estimates his liabilities at £900, and values his interest on the various patents at £2,950. Consequently, he does not admit insolvency, and gives as the causes of his temporary embarrassment his inability to develop and dispose of the foreign patents relating to the automatic target, and the prolonged illness of his wife.

In the absence of any offer, Mr. Alexander Nisbet, chartered accountant, 3-4, Lincoln's Inn Fields, W.C., was appointed as trustee to administer the estate in bankruptcy with the assistance of a committee of inspection.

Midland Electrical Engineers' Ball.—This event will be held at the Grand Hotel, Birmingham, on Friday, November 28th; music at 8.15 o'clock, dancing from 8.45 to 2 o'clock. Tickets, inclusive of refreshments, hot supper, &c., are one guinea each, and they can be obtained from any member of the Committee, or from Mr. G. J. Bish, 55, Newhall Street, Birmingham, the hon. secretary and treasurer, who will forward particulars to any of our readers who are interested. A circular has been issued giving particulars of train services between London and Birmingham and Manchester and Birmingham.

Manchester Electrical Workers.—A correspondent writes:—"The members of the Installation Section of the Manchester Electrical Trades Union came out on strike on Monday morning, consequent upon the Electrical Employers' Association refusing to concede an advance of 1d. per hour in wages. About 300 men are affected. The strike will affect a large number of buildings in the course of erection, and delay the installation of electric light. It was stated that several firms had agreed to pay the advance of 1d. per hour, but no communication had been received from the newly-formed Employers' Association."

The Prestige of the Press.—We have followed with great interest the correspondence on the "Prestige of the Press" that has been appearing in the *Times* this week. The editorial comments and declaration of policy we have also closely studied, and we thoroughly approve of the decision of our august contemporary to refuse in future to take advertisements from agencies which supply news, or news from agencies which supply advertisements, but wild horses shall not draw from us all our thoughts. We always have disapproved of the increasing attempts to blend advertisements with news, whether the news came from an advertisement agent or from any other source. The "puff preparatory" and the *quid pro quo* alike are an abomination to all who want the Press to maintain a high standard, and the astonishing thing is that firms of otherwise high repute have, through their organisations or agents, helped to lower the standard, making, at times, demands upon editors which no self-respecting journalist could concede. Our own views on this subject are pretty well known, but we may repeat them in the terms used in a *Times* leader of Wednesday last:—"One of the first things that a newspaper reader has the right to expect is that both the news presented to him, and the editorial comment thereon, shall be impartial, in the sense that they shall be free from any suspicion of influence on the part of interested persons." We need not enter into the details of the absurd, though to us by no means surprising, circular issued by Reuter's Financial Publicity Department, and now withdrawn, nor need we discuss the protests of the different advertising agents, but we certainly do feel justified in asking the *Times* to see whether it cannot change its policy in regard to the reporting of company meetings. We know that it has a notice to the effect that "Reports of Proceedings under the heading 'Company Meetings' are inserted as advertisements, but care is taken to ensure that they be trustworthy." This savours somewhat of an apology to the reader for serving up what may not be quite so trustworthy as such things used to be in the olden days, and we suspect that the editors, in their zeal to maintain a lofty standard, would be far happier if they did not have to publish that notice.

London Electricians' Wages Movement.—We are informed that members of the Electrical Trades Union in the London district met on Tuesday last in the large hall of the Club and Institute Union, Holborn, to consider the final arrangements for their effort to secure an advance of wages, and late comers had a difficulty to find standing accommodation. A resolution was carried instructing the London District Committee to immediately formulate demands on both associated and non-federated employers, embodying 11d. an hour for electrical fitters and wiremen, with a recognised code of working rules, other grades to receive corresponding increases. Among other matters discussed were the measures to be adopted to obtain these objects and a ballot vote was taken.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—Mr. W. H. Taylor has resigned the position of assistant electrical engineer at Walthamstow having accepted an appointment under the Government of Western Australia as chief station superintendent at the new power station at Perth. Mr. G. J. Hollyer has been promoted to the position of station superintendent.

Consequent on the departure of Mr. E. W. L. Nichol to take up a position in London, the Yorkshire Electric Power Co. have appointed Mr. Fred Platt, of Birstall, to the position of assistant superintendent at the company's generating station at Thornhill, near Dewsbury.

Advance of salaries have been given to the following employés at the Middleton Electricity Works:—W. Butterworth, station superintendent; J. Grandidge, outside foreman; P. Ridings, senior shift engineer; and P. Illingworth, second shift engineer.

Mr. W. W. Warren, a charge shift engineer at Greenwich generating station (L.C.C.) since May, 1911, has resigned his appointment.

Tramway Officials.—Mr. F. Eggington has resigned his appointment as principal assistant to the West Ham tramways undertaking. Owing to the vacancy thus caused the Tramways Committee have appointed (1) Mr. W. Hopkins to the post of chief assistant, at a salary of £250 per annum, rising by annual increments of £25 to £300; (2) Mr. A. C. Debenham to be accounts clerk at £200 per annum, rising to £220 by annual increments of £10; and (3) Mr. J. O'Niel to be traffic clerk at £120 per annum, rising by annual increments of £10 to £150. The department now require a traffic superintendent, at a commencing salary of £225 per annum, and the filling of this post has been left to the tramways manager and the chairman of the Tramways Committee.

Inspector J. Campbell, of the Manchester tramways, who has just retired, has been presented with a silver coffee service by the employés of the Oldham Road branch. Passengers on the Rochdale Road section have given him a timepiece.

The *Review of the River Plate* states that Mr. S. C. Marengo, sub-manager of the Buenos Ayres and Pacific Railway Co., has resigned that position, having been appointed general manager of the Central of Buenos Ayres Railway Co. and the Lacroze Tramways Co.

General.—On Thursday last week, at the Arc Works Club Room, Mr. A. J. Hodgson, the former joint manager on Messrs. Crompton & Co.'s electrical engineering works, Chelmsford, was the recipient of a presentation subscribed for by the directors, members of the staff, and some of the employés of the firm. The presentation took the form of a handsome silver salver. Mr. Carleton F. Tufnell presided, and was supported by Mr. E. Reeves (managing director), and Mr. P. G. Cheverton, who acted as hon. secretary to the presentation fund. The chairman said that for something like 20 years Mr. Hodgson had been closely connected with the works, winding up his honourable career in the responsible position of joint manager. During all those years Mr. Hodgson had displayed a loyalty to the company and a zeal in his work which had gained for him the esteem of them all. His gentle courtesy had been unfailing, and his modesty was only equalled by his high sense of honour, while his sympathy and kindness of heart could not fail to have endeared him to all those who had the privilege of working under him. The chairman then read a letter from Mr. Claud Crompton, who wrote regretting his inability to be present, and said that after all the long years that he had worked in friendship and harmony with Mr. Hodgson, as his immediate subordinate, he felt there could be no one so qualified as himself to speak of Mr. Hodgson's great gifts as a manager of men. Those under him, who had known and liked him, had realised to what extent he could be a friend, and, at the same time, a strong master to be obeyed. But he doubted if many realised to what extent Mr. Hodgson had had to face difficulties, and how he had borne them on his own shoulders so quietly that those under him hardly knew they existed. In conclusion, Mr. Crompton wished Mr. Hodgson all happiness in the future. Mr. Hodgson, in reply, said that in the past they had together gone through many difficult jobs; but he could assure them that the one they had put before him was one of the most difficult he had had to deal with. He could not tell them how much he appreciated all the kind words spoken by Mr. Tufnell, and their very great kindness to him in presenting him with the handsome and valuable present. He felt deeply grateful to all, not only because he had such a handsome tray to take away, but more especially because this was a demonstration of the good feeling which had always existed between the members of the same company. The fact that they had always given him their support in every way was constantly before him, and added in no small measure to the very great regret he felt when, last November, he decided that the time had come for him to lay down his duties. He had always

met with the greatest kindness, and he thanked them most sincerely. He could assure them that when one had to break with one's work and with old friendships and associations, it was comforting to feel that one could look back with much pleasure as he did to the time he had had with them. They had had hard times, but these had only gone to strengthen the good feeling between them and bring out the best in them. He sincerely trusted that the good feeling that had always existed between the directors, the staff and the employés would long continue. On the proposal of Mr. Cheverton, a hearty vote of thanks was accorded Mr. Tufnell, who, at the close of a brief response, called for cheers for Mr. Hodgson, which were very heartily given.

The wedding of Mr. W. M. D. Pell, director of Oliver Arc Lamp, Ltd., Engineering and Arc Lamps, Ltd., and the Varley Magnet Co., Ltd. (second son of the late Mr. Bennett Pell, M.I.E.E.), to Miss Evelyn Georgie Sandwith, only daughter of the late Col. Hartley Sandwith, C.B., took place at Horsell Parish Church, Woking, Surrey, on Tuesday last. The honeymoon is being spent in a motor tour through Devonshire and Cornwall.

Dr. O. W. Richardson, F.R.S., has been appointed to the Wheatstone Chair of Physics at King's College, London, in succession to Prof. C. G. Barkla.

The address of Mr. J. S. Raworth is now 12, Becmead Avenue, Streatham, S.W.

Mr. John Hollingworth, B.A. (Cambridge), and B.Sc. (London) has been appointed Assistant Lecturer in Electrical Engineering at the Manchester University.

At Birdwell United Methodist Church, on October 22nd, the marriage took place of Mr. Arthur Kenworthy, chief electrical engineer to the Barnsley Electric Traction Co., and Miss Morris.

Obituary.—A. S. Giles.—We have received the following appreciation of the late Mr. Giles from a correspondent:—"The death of Mr. Alfred Giles, cut off in the prime of life by enteric fever, takes one back to the very beginnings of electrical engineering as we know it now, to the time, in fact, when the the whole thing was in the cradle; it is difficult to realise this was only 30 years ago. Mr. Giles began his working life on the engineering staff of the Edison Co. in London; in the middle eighties, installation work, as far as incandescent lighting was concerned, was largely in the hands of the amalgamated Edison and Swan interests, Siemens Bros., and one or two small private firms, and in the course of his service with the Edison & Swan Co., Mr. Giles had to do with many of the original installations in the country. He remained on the staff of this company through all the changes and vicissitudes of the concern in the early nineties, finally leaving it soon after the installation department was given up. After five or six years on the staff of Thompson, Ritchie and Co., Mr. Giles went to Blackburn as engineer of the Corporation Electricity Department, and held that position to his entire credit, till in 1904 he was appointed engineer-in-chief of the Cape Tramways—by no means a sinecure at the best of times, and just at that period in need of a strong hand. So successful was his control of these tramways, that when in the spring of 1911 occasion arose for a change in the management of the Lisbon tramways, the Eckstein interests transferred Mr. Giles from the Cape to Lisbon as manager and engineer-in-chief of the electric tramways there, a post of great and onerous responsibility. It is no more than the truth to say that his management of the tramways during the troublous times of the past two years in that hornets' nest of warring factions, has been conspicuously successful, and has shown Mr. Giles to be possessed of a wise discretion. Mr. Giles combined in his person sound technical knowledge and shrewd mother wit, leavened with a sense of humour which often helped him over the hard places in life; a hard worker, he was above all things thorough, detested second-rate and 'shoddy' work, and showed to a marked degree that sterling quality of grit one likes to associate with Englishmen, and which he doubtless inherited from his father, a typical Cheshire parson of the old school; he never left a job half done. Those working with him, no matter in what position, soon came to know that he was a man on whom they could rely, and the cordial nature of his relations with both employers and staff was doubtless due in great measure to this knowledge."

The death has taken place at Salisbury of Mr. Malden, who was secretary of the Salisbury Electric Lighting and Supply Co. from its formation.

Several South African correspondents have sent us by the last mail particulars of the motor accident which occurred on October 8th, resulting in the death of Mr. James Herbert Cawthra, the station superintendent of the Victoria Falls and Transvaal Power Co., Ltd. Mr. Cawthra, it appears, left the Rosherville power station in his motor-car about 9 o'clock in the morning in order to proceed to the Simmer Pan power station. As he was driving over the level-crossing between the Simmer Deep and the mine properties, a motor-train carrying passengers ran into his car. The motor-car seems to have been struck by the front of the train, and was hurled along the railway line for about 100 yards. Mr. Cawthra was pitched violently from the car, and killed instantaneously. Mr. Cawthra had been in the country about two years; he was about 45 years of age, and leaves a widow and four children, who are all at present in England, except the eldest son, aged 17, who is a storekeeper at the Rosherville power station. At the time of the accident he was an inmate of the Simmer and Jack Hospital, suffering from blood poisoning in the foot, and he saw his father's body brought into the same hospital without knowing who it was. It appears that Mr. Cawthra had had three motor accidents of a more or less serious nature during the last nine months.

Wills.—The late Mr. W. Thom (Yates & Thom, Ltd., Blackburn) left £128,089 gross and £120,243 net personalty.

Mr. Frederick Brown, managing director of the Walsall Electrical Co., Ltd., who died in August last, left £2,404 gross and £1,301 net.

The late Mr. A. B. Wilson, a director of the Central Ireland Electric Power Co., left £6,553.

NEW COMPANIES REGISTERED.

Bentham Electric Supply Co., Ltd. (131,740).—This company was registered on October 22nd, with a capital of £1,000 in £1 shares, to carry on at Bentham and elsewhere the business of an electric light and supply company in all its branches. The subscribers (with one share each) are:—C. H. Best, 72, Market Street, Bradford, incorporated accountant; T. B. P. Ford, Low Bentham, silk spinner; E. Ayrton, Low Bentham, silk spinner; J. Parker, Low Bentham, silk dresser; J. Cumberland, Bentham, builder; C. Pullan, 80, King's Arcade, Bradford, engineer; H. H. Casse, 24, Cunliffe Terrace, Bradford, electrical engineer. Private company. The number of directors is not to be less than three or more than five; the subscribers are to appoint the first; qualification, £100; remuneration as fixed by the company. Registered office, Joint Stock Bank Chambers, High Street, Skipton. Solicitors, Gaunt, Foster & Co., Bradford.

Watson, Marsh & Co. (Brondesbury), Ltd. (131,795).—This company was registered on October 24th, with a capital of £1,000 in £1 shares, to carry on the business of designers, manufacturers, exporters and importers of, contractors and factors for, and dealers in, electric light and other electrical apparatus, conduits, dynamo machines, lamps, fittings, and accessories, &c. The subscribers (with one share each) are:—J. B. Marsh, 6, Hoviden Road, Cricklewood, N.W., electrical engineer; M. Cohen, 25, Brondesbury Road, Kilburn, N.W., electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are J. B. Marsh and M. Cohen (both permanent joint managing directors); qualification of such managing directors, 100 shares. Registered by Alfred H. Atkin, 27-8, Fetter Lane, E.C.

CITY NOTES.

Norwich Electric Tramways Co., Ltd.

The seventeenth annual ordinary general meeting was held on Wednesday at the office, 8, Crosby Square, Bishopsgate, E.C., the Hon. Arthur Brand presiding.

The Chairman, in moving the adoption of the report, remarked that he had very little to add to the information therein given. He was glad to say that the tramways had done better in 1913 than in 1912, and, further, he was extremely pleased to state that there had been a very considerable increase in the earnings up to date in the current year, as compared with the corresponding period last year. Norwich was in a prosperous state, and he hoped that condition of things would continue. It was the intention of the directors to deposit a Bill in Parliament to obtain powers to make some further improvements in the line.

Mr. Geo. M. Chamberlin seconded the motion, and the report was adopted.

Stock Exchange Notices.—The Committee has appointed a special settling day as under:—

Humphrey Pump Co., Ltd.—30,000 ordinary shares of £1 each, 10s. paid, Nos. 1 to 30,000; 100,000 ordinary shares of £1 each, fully paid, No. 30,001 to 130,000; and 25,000 7 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 25,000.

And ordered the undermentioned security to be quoted in the Official List:—

London and Suburban Traction Co., Ltd.—Further issue of 166,463 ordinary shares of £1 each, fully paid, Nos. 1,666,674 to 1,833,136; 264,791 5 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,316,269 to 1,581,059; and £14,893 4½ per cent. mortgage debenture stock.

Applications have been made to the Committee to appoint a special settling day in and to grant a quotation to:—

Newcastle-upon-Tyne Electric Supply Co., Ltd.—Scrip fully and partly (65 per cent.) paid for £400,000 5 per cent. second mortgage debenture stock.

And to appoint a special settling day in:—

Marconi International Marine Communication Co., Ltd.—204,056 shares of £1 each, fully paid, Nos. 1 to 114,526, 114,551 to 123,458, 123,589 to 128,688, and 128,729 to 204,200 *ex* dividends paid previous to 1913; and a further issue of 102,028 shares of £1 each, fully paid, Nos. 114,527 to 114,550, 123,459 to 123,588, 128,689 to 128,788, and 204,201 to 306,084.

Western Telegraph Co., Ltd.—After transferring £100,000 to the general reserve fund, £10,000 to the land and buildings depreciation fund, and £45,000 to the provision on account of investment fluctuations, a final dividend of 3s. per share is recommended (making, with the previous distributions, a total dividend of 6 per cent. for the year ended June 30th, 1913), and also the payment of a bonus of 2s. per share, both free of income-tax. The balance of the account is carried forward. The register of transfers will be closed from November 4th to 12th.

Montreal Light, Heat and Power Co.—A dividend of 2½ per cent., being at the rate of 10 per cent. per annum, for the quarter ending October 31st, is announced.

Ferranti, Ltd.

Mr. A. W. Tait (chairman) presided on Friday at Central House, Kingsway, W.C., over the eighth annual general meeting of this company.

In moving the adoption of the report (see Electrical Review, page 624), the Chairman said that the shareholders would observe that the company had again had a satisfactory year. The result of the trading was £59,599, as compared with £51,759 last year, or an increase of £7,840. There was, however, an increase of £3,325 in the general establishment charges (from £22,771 to £26,097), accounted for by the increased turnover of the business, the increase in the charge for income-tax, and the expenses in connection with the repayment of the prior lien debentures and the issue of the five-year notes. There was also included under this head the charge in connection with the Insurance Act, which amounted to £1,085. Repairs and renewals were £6,741, as compared with £5,587, the increase of £1,153 being due to reorganisation in certain of the departments at the works in which extensions had been carried out. The net result was £28,142, as against £24,333, or an increase of £3,809. The interest charges were somewhat different from those of the previous year, owing to the repayment of the prior lien debentures and the issue of the 6 per cent. notes already mentioned. The total interest payable on debentures, notes and loans amounted to £8,146, as against £7,204 last year. The net profits for the year showed an increase of £2,867. The balance of profit for the year was, therefore, £9,996, plus the amount at credit at June 30th, 1912—£12,456—making together £22,452. There had been carried to general reserve account £22,000, leaving a balance to be carried forward of £452. In accordance with the usual practice, £10,000 had been carried to depreciation reserve, which now stood at £56,350. With regard to the amount which had been carried to general reserve account, he would remind the shareholders of the statement which he made last year, that in accordance with the arrangement made in connection with the repayment of the prior lien debentures and the issue of the 5-year notes, the company was not in a position to make any payment to the shareholders until these notes had been redeemed. As they were aware, they fell due in 1917, and, until that period, the profits which the company might make would be accumulated so that the position of the company might be so strengthened that when the re-organisation of its capital took place—as it must do at that time—the directors would be able to put forward a scheme which would enable the company to commence and to continue the payment of dividends on the shares. Because of these arrangements it was felt meantime that nothing should be done with regard to writing down the value of goodwill and patent rights as that adjustment could be made when the reorganisation took place. Turning to the balance-sheet, he would enumerate the principal changes which had taken place in the assets and liabilities. Leasehold land and buildings, standing at a value of £52,560, showed an increase of £2,706 over the previous year. Plant, machinery, tools and fixtures at £120,825, showed an increase of £7,518 over the previous year. The increase on those two items was a very considerable sum, £10,224, and it was due to the new buildings which were erected and the plant installed in connection with the development of the meter department. Those extensions were absolutely necessary to enable the company to cope efficiently with the largely-increased turnover in that department, and he hoped they might now be able to go on for a year or two without considerable addition to their fixed assets. Expenditure on work in hand at £77,118, showed an increase of £16,114 over the previous year: and stock and stores in hand at £21,629 showed an increase of £5,483 over the previous year. The increase in these two items amounted to £21,597, and was to be accounted for by the increase in the company's turnover which he had previously mentioned, and was also due to the fact that a large order was in course of completion at the date of the close of the accounts. Sundry debtors at £66,102 showed an increase of £5,389; and they would observe that a new item appeared, viz., London office fixtures and fittings, £1,373. The directors felt for some considerable time that it was necessary to consolidate the sales administration of the company, and that that could not be done better than by the establishment of a proper organisation in London, from whence the majority of business emanated or was controlled. Cash at bank and in hand was practically the same as last year; and goodwill and patent rights remained at the fixed figure of £69,547. With regard to the liabilities side of the balance-sheet, he had already mentioned the repayment of the balance of the prior lien debentures, and the issue of the five-year notes. They had already redeemed £1,100 of those notes, and a further sum of £1,000 fell to be applied on December 31st. A sinking fund on the first mortgage debentures had been commenced, and they would observe from the account that they had been able to redeem £4,000 of those debentures during the year. A further amount fell to be applied on December 31st, and they hoped to be able to redeem an equivalent amount of debentures. The bankers' loan secured on second debentures showed a decrease of £3,529, and that was due to a special payment which was made in reduction of the loan at the time of the issue of the notes, and because the annual payment of the interest to the sinking fund on the second debentures was more than sufficient to meet the interest on the loan. The application of these sinking funds should gradually reduce the company's indebtedness, and in the course of a few years' time should place it in a very strong position. Sundry creditors stood at £51,238, which was an increase of £15,188 as compared with the previous year. The increase in sundry creditors more or less reflected the increase in the volume of the company's business, but they hoped that by the elimination of any large amount of capital expenditure during the current year to be able considerably to reduce this item. With regard to the business generally, as he had already mentioned, during the year under review the company's turnover was a record since the date of the reorganisation, and the name which the company had established for its manufactures led them to believe that that should be maintained—if not increased. The company was now one of the most important heater manufacturers in the country, and had also a large export business which was rapidly and satisfactorily being built up. In particular he might mention that they had now a well-established business in Canada, and the managing director had paid a visit there during the summer, as had been his custom for some years past. He reported very favourably on the position and prospects, and in order to put themselves in the position for further development in that country they had registered a separate company called the Ferranti Electrical Co., of Canada, Ltd. The whole of the shares of the company would be allotted to Ferranti, Ltd., and when times were better they might be able to make some arrangement which would relieve the company of its large investment there and supply the Canadian company with additional working capital to further its business. The company was also developing lines of electrical cookers and heaters for which there was expected to be a gradually increasing demand in the near future. A great deal of time and money had been spent upon the development of those articles, and they believed that those which were now being put upon the market were decidedly good, and their reception by the trade was encouraging. With regard to the switch department, the directors had for a long time been considering the policy to be adopted in that connection. The carrying out of large switchboard contracts involved, as they knew, considerable locking up of the liquid resources of the company, and business of that kind was not only highly competitive but also carried a fair amount of risk. After deliberation the board had decided that in future that department should devote itself to the perfecting of switch details which were used in considerable numbers on large switchboards, and by specialising in that way the company should be able to build up a remunerative and expanding business with all the large switchboard manufacturers in this country, and probably elsewhere. That did not mean that the company would not continue to do a large amount of switch business, for which it was eminently suited, but referred only to large switchboard contracts. The general switch business in small boards had been growing in an encouraging manner for some time, and it was believed that the change in the policy of that department would show greatly improved results.

Mr. A. B. Anderson (the managing director), in seconding the motion, said he might amplify the chairman's explanation of that which he had seen described in the Press as their new policy. With regard to the meter department, he need say nothing except that, in his opinion, it was most highly satisfactory. The heavy capital expenditure of the last year had enabled them to obtain their output without regular overtime, the first time for four years. It had also removed any risk which there might have been of the very serious pressure on their capacity deteriorating the product. That risk had been avoided. With regard to the switch department, it was some three years since he first began to question very much the desirability of continuing that department as then constituted. At that time competition was at its keenest and trade bad. The decision arrived at was to persevere for some time further with the development of standard lines which they had then initiated, before making any radical changes. That was done and now showed every sign of filling their shops, and more than filling them, without switchboard contracts. Therefore, persistence in everything would have meant continuation of the heavy capital expenditure, which had been a feature of the past few years. While the meter department had fully warranted it, the results of the switch department had not warranted a similar expansion on its behalf. They had, therefore, decided to cut their manufactures to suit their present works capacity rather than embark upon further increase of their works until fully satisfied that it was for the purpose of accommodating profitable work. That would, of course, give them relief from the most troublesome and onerous part of their present business, besides freeing space and capital for the prosecution of repetition lines of manufacture. They had been at a certain disadvantage in switchboard manufacture, because theirs had been of that class which found its competitors amongst the big manufacturers. They anticipated that in ceasing to be switchboard manufacturers they should open up a big market amongst those who had been, until lately, their competitors for their switchgear. They would, he hoped, recognise that while it was easy to cut out with a stroke of the pen a considerable portion of one's turnover, it was by no means so easy to cut down overhead charges accordingly, so that perhaps they would have some little set-back before they felt the full benefits of the change. He might also add that on his recent visit to Canada he found serious depression right across the Continent, but the chairman, nevertheless, correctly represented his views when he said he was confident for the future, in spite of a serious drop in their trade for the past few months. He regarded that as temporary, while the possibilities for the future were incalculable. Amongst the development work which was going on, there was in several lines which they believed would help their output considerably, and while he thought it necessary to mention one or two factors which might have a prejudicial effect upon the current year, he was very hopeful indeed that it would not be long before he found it necessary to recommend a continuance of the policy of expansion which had been the way, and the only way, by which the company had recovered its position amongst electrical manufacturers.

The retiring directors having been re-elected,

Mr. Sugden proposed a vote of thanks to the directors and managing director and staff, and remarked that he was an involuntary preference shareholder of the company. When he had the shares allotted to him, he looked on them as so much waste paper, but now he looked on them as an asset of increasing value.

The motion was carried, and the Chairman, in reply, reiterated his previous remarks as to the value of the company when the capital was eventually reorganised. He could endorse the statement that the staff were loyal and enthusiastic.

Berlin Electricity Works.

The report for 1912-13 of the Berliner Elektrizitäts Werke, A.G., which have a monopoly of the supply business in the German capital, states that the undertaking experienced a further satisfactory development during the year. The increase in the consumption, which rose from 223,000,000 KW.-hours in 1911-12, to 252,000,000 KW.-hours in the past year, was principally due to the enhanced requirements of large consumers. The number of customers advanced from 36,909 to 43,816, or by 28,781 KW., and the equivalent value of the total connections increased to 255,721 KW. Of this total 93,514 KW. were low-tension for lighting purposes, 131,662 KW. were for power, and the balance for high-pressure supply. The maximum demand at any time was 107,150 KW., as contrasted with 94,570 KW. in the preceding year. Owing to the low prices, large consumers are becoming more and more convinced that a connection with large works offers advantages over production on their own account. Preparations are being made with the object of making fundamental alterations in the tariffs, but the bringing into operation of a new scheme is postposed, owing to the uncertainty as to whether the company will remain in possession of the undertaking. It is proposed for this purpose to remove the centre of production to the site of fuel deposits, and lignite mines have therefore been secured in the vicinity of Bitterfeld of such an extent as is rarely combined under a single ownership. The tests made with arc lamps of long lighting duration have led to satisfactory results, and an important advance in public lighting is held in prospect by the introduction of new wire lamps of high candle-power which consume one-half of the energy incidental to the similar lamps hitherto in use. Nothing is mentioned as to the cost of production, but the average sale price realised in Berlin, after deducting the profit share paid to the municipality, declined from 14·75 pfennigs (1·73d.) per KW.-hour in 1911-12, to 14·45 pfennigs (1·69d.) in 1912-13. A steam turbine of 20,000 H.P. was installed at the Oberspree works and a second of similar power at the Rummelsburg works, and no fewer than 40 isolated battery stations were in operation as a result of the increasing requirements of owners of electromobiles. The accounts indicate the following results for the two years :—

	1912-13.	1911-12.
Ordinary share capital	£2,205,000	£2,205,000
Preference shares (4½ per cent.)	1,000,000	1,000,000
Loan capital	2,820,000	2,847,000
Gross profits	975,000	910,000
General expenses	91,000	87,000
Renewal fund	30,000	28,000
Depreciation	252 000	288,000
Net profits and balance forward	568,000	553,000
Reserve fund	27,000	27,000
Profit share of municipal council	196,000	187,000
Dividend on ordinary shares	264,000	264,000
Dividend, per cent.	12	12

The report proceeds to state that the municipal council has exercised its right of giving notice to acquire the company's undertaking on October 1st, 1915, although negotiations are in progress with a view to the prolongation of the concession. An attempt is being made to find a basis for a fresh understanding, and an agreement would be valuable to the company if the operation of the works were assured to it for a long period of years. Should, however, the negotiations fail to reach a conclusion satisfactory to the company, the extensive amount of capital which would become available by the transfer would enable the company to devote its activity to new and profitable enterprises for which preparations have been made for several years past, this observation referring partly to other supply works in which the company is already largely interested from a financial point of view.

United Electric Tramways Co. of Caracas, Ltd.

The directors' report for the 12 months ended June 30th, 1913, states that the net revenue account shows a disposable balance of £9,205, out of which the directors recommend the payment of a dividend for the year of 5 per cent. (less income-tax) on the share capital, which will absorb £8,500, leaving £705 to be carried forward. The profits of the local company (the whole capital of which is owned by this company) for the past year have again shown a gratifying increase :—

	1912-13.	Increase.
Gross receipts	Bs. 1,397,259·07	Bs. 149,853·70
Operating expenses	717,776·02	29,165·88
Net receipts	Bs. 679,483·05	Bs. 120,687·82

At an average exchange for the year, 25·70 = £26,439.
As compared with 25·96 = £21,525. Inc. £4,914.

After adding the balance of profit carried forward from the previous years, viz., Bs. 390,476 to the above net receipts for the year, providing for the mortgage interest payable to this company, viz., £10,200 (= Bs. 257,550), setting aside Bs. 50,000 to reserve and renewal funds, and paying a dividend amounting to Bs. 220,600 (equal to a dividend on this company's issued capital of 5·19 per cent.), the local company are enabled to carry forward Bs. 539,809·22. After making the above provision for mortgage interest and reserve and renewals, the profit for the year is equal to 8·66 per cent. upon this company's issued capital. Notwithstanding an increase in operating expenses, due to the increased traffic, the ratio to gross receipts is less by 3·83 per cent. compared with the previous year, which was 2·38 per cent. less than 1910-11.

The following table of statistics compares the result of the 12 months 1912-13 with the corresponding period 1911-12 :—

	1912-13.	Inc. or dec.
Passengers carried	4,838 378	+ 435,279
Car-miles run	967,566	— 6.956
Percentage of operating expenses to gross receipts	51·37	— 3·83
Receipts per car-mile	Bs. 1,44	+ Bs. 0 16
Operating expenses per car-mile	Bs. 0 74	+ Bs. 0·03
Number of cars	44	+ 3
Miles of track	16½	+ ½

In compliance with the terms of the trust deed, £990 has been placed to the sinking fund for the redemption of mortgage debenture stock, and £1,100 first mortgage debenture stock has been purchased this year in the market and cancelled. Mr. Wallis reports that all the company's property is maintained in first-class order, and that the prospects for the present year are good. Further short extensions to the tramways are in course of construction, and others are projected.

Allgemeine Elektrizitäts Gesellschaft.

The directors of this Berlin company have issued a communication announcing that the net profits for 1912-13, after deducting general expenses, taxes, interest on loans, and £69,000 as the cost of the last issue of obligations, amount to £1,445,000, which sum has been derived exclusively from manufacturing. This compares with £1,219,000 in the preceding year. At the general meeting on December 3rd, it is proposed to declare a dividend of 14 per cent. on share capital of £7,750,000, as contrasted with 14 per cent. on £6,500,000 in 1911-12. In addition to the provision made for depreciation according to the custom hitherto, it is intended to place £50,000 to the reserve fund, to allocate £75,000 to the national defence tax, and to apply £50,000 to special depreciation for buildings having regard to new extensions. The company's credit at the bank, the communication adds, amounts to £3,850,000, and both the invoiced turnover in 1912-13, and in particular the orders on hand in the new year, show an increase. The appended table indicates the financial progress in recent years :—

Year.	Net profits.	Dividend.	Dividend percentage.	Placed to reserve.
1906-7	£743,000	£600,000	12	£50,000
1907-8	796,000	600,000	12	50,000
1908-9	819,000	650,000	13	63,000
1909-10	821,000	700,000	14	100,000
1910-11	1,107,000	805,000	14	118,000
1911-12	1,219,000	910,000	14	150,000
1912-13	1,445,000	1,085,000	14	175,000

It will be observed that the dividend for 1912-13 is payable on a larger amount of share capital than in the previous year. The imposing bank credit of £3,850,000 compares with £1,875,000 a year ago, and will enable the company to proceed with the development of the undertaking, quite independently of the condition of the money market. Although the directors do not mention the actual turnover in the past year, it is unofficially stated that the value amounted to £22,000,000. Last July, however, the company reported that the turnover and orders on the books in the first 10 months of the financial year surpassed by £4,500,000 the value in the corresponding period in 1912. The value in 1911-12 was not intimated, but the business transacted reached £15,300,000 in 1910-11, and £12,600,000 in 1909-10.

Companies Struck off the Register.—The following companies have been struck off the register, and are accordingly dissolved :—

Haste Pump Co.
Midgley's Electro-Therapeutical Co.
Motor Traction Co., 1905.

The following will be struck off the register at the expiration of three months, unless cause is shown to the contrary :—

Auto-Controllers.
British Electro-Ads.
Electrical-Instrument Manufacturers.
Electro-Medical Institute.
Improved Electric Traction.
Mica Boiler Covering Co.
Midget Steam Trap Syndicate.
Phosphor Bronze Co. (registered May 20th, 1874).
Solium Electrical Co.
Wimshurst Hollick & Co.

National Telephone Co., Ltd.—Mr. Justice Sargant decided on July 16th last that the whole of the surplus assets was distributable among the deferred stockholders, but leave was given to the preference shareholders and holders of preferred stock, if they so desired, to appeal against this decision by giving notice not later than the 13th inst. This date having expired and no notice of appeal having been given, there can be no further payment to the holders of preference shares or preferred stock. The liquidator has therefore arranged to make a further distribution to the deferred stockholders, being a further 7 per cent., equal to 1s. 4·8d. in the £, making a total distribution to date of 104 per cent. Subject to certain contingent liabilities, the final distribution will be about 1 per cent., which it is expected will be made in the course of two or three months.

Water Softeners, Ltd.—The directors' report for the year ended June 30th, states, according to the *Financial Times*, that the trading account shows a profit of £8,948, a sum sufficient to defray all working costs, amounting to £5,594, and to provide £3,359 towards administration expenses, depreciation, &c., leaving £728 to be carried to the balance-sheet. Sales of plants have increased to a very satisfactory extent, and the directors are confident that a solid foundation is being established, upon which the number of sales is being, and will be considerably, increased in the future. The directors are now adopting several new processes for working the patents owned, the results from which prove that such expenditure has been fully justified.

Victoria Falls and Transvaal Power Co.—It is stated in the financial Press that the net earnings, including those of the Rand Mines Power Supply Co. for the quarter ended September 30th, amounted to £105,699. This includes the month of July, during which time the Power Co.'s operations were considerably curtailed owing to labour disturbances. The months of August and September show that the number of units sold was in excess of that for the first quarter of the current year, but is not quite up to the average of the second quarter, owing, probably, to the decrease of the native labour and the consequent curtailment of mining development. This, however, is anticipated to be only of a temporary nature.

German Edison Accumulator Co.—It is announced that this company, of Berlin, which was formed in 1906, has decided to dispose of its undertaking to the Accumulator Co., of Berlin and Hagen. The former has a share capital of £150,000, of which the sum of £125,000 is paid, and the purchase price is at the rate of 50 per cent. of the latter, or £62,500, which the Accumulator Co. will be able to provide out of funds already available. As a result of the transfer, the Accumulator Co., which controls the Tudor battery, and which already occupies an exceedingly strong position, will have almost a monopoly of the secondary battery trade in Germany.

Nagpur Electric Light Co.—The report of the directors for the half-year ending June 30th, 1913, states that construction work is rapidly approaching completion, and the contractors expect to be able to hand over the whole installation in working order by the beginning of November next. The boilers and engines were to be ready for testing by October 15th. Electrical energy for street lighting, as also for lights and fans in some of the Government offices and bungalows, will be supplied immediately in accordance with contracts with the Government and the Municipality, and prospects of further connections to private buildings, offices and shops appear exceedingly hopeful.

Reduction of Capital.—Brecknell, Munro & Rogers, Ltd.—A petition for the confirmation of the reduction of capital from £30,000 to £20,000, has been presented, and will be heard on November 11th.

British and Colonial Zoelly Turbine Syndicate, Ltd.—The confirmation of the reduction of capital from £20,000 to £10,000 is now pending. Creditors must send in their claims by December 1st to Mr. F. M. Jeboult, 9, Walbrook, London, E.C., solicitor to the company.

Japan.—No less than £682,500 was invested in connection with electrical undertakings in Japan during September last, £660,000 being in respect of new companies and £22,500 for the extension of old concerns.

British Coalite, Ltd.—The scheme for reorganising the capital, as mentioned in our last issue, was passed at an extraordinary general meeting held in London on October 22nd.

Kaministiquia Power Co.—The directors have declared a dividend on the common shares at the rate of 5 per cent. per annum for the quarter ending 31st inst.

Chloride Electrical Storage Co., Ltd.—An interim dividend of 5 per cent. on the ordinary shares is announced.

Anderston Foundry Co., Ltd.—An interim dividend of 4s. 6d. per share is announced.

STOCKS AND SHARES.

Tuesday Evening.

The relaxation of the stringency in the monetary position, exemplified on Monday by a reduction in the German Bank Rate, was a source of mild satisfaction to the Stock Exchange markets, bringing in its train a quiet improvement in certain investment descriptions. Business is still confined mainly to investors, whose purchases make steady inroads on the piles of securities that came forward so liberally earlier in the month. Fortunately, there has been a breathing space in the rush of new issues, and the relief thus afforded to markets has been welcome and evident. Consols rose sharply, so lending powerful aid in the dissipation of depression.

The Stock Exchange Committee have aroused a good deal of public attention by their own inquiry into the circumstances attendant upon the introduction of American Marconi shares to the Miscellaneous market some 18 months ago. The matter is largely technical, and therefore difficult to explain in black and white. Marconi shares themselves have fallen to $3\frac{1}{16}$ on sales made by people desirous of taking up their proportion of the new capital. Canadians have gone back to 8s. 9d., the recently-issued report leading to realisations, which, it seems to us, are natural enough, having regard to the nature of that report. Americans, in sympathy, are lower at 16s. 6d., and the Marconi market, as a whole, is distinctly dull.

The weakest market in the Stock Exchange has been that for Mexican securities, every day bringing in a fresh torrent of selling orders. Affairs in Mexico have certainly come to a pretty pass; and if it be true that the disturbances were started, and have been financed, by American oil interests, the latter are probably unpleasantly surprised by this time at the turmoil they have brought about, since it has reacted upon American Rails and other things connected with the United States. As we have said previously, it is not only the revolution that is troubling investors, but the fall in the rate of exchange—which, of course, is one direct outcome of the riots—must tell heavily upon the profits of all the companies doing business in the country.

The heavy falls of a week ago in the issues of the utility companies have been continued farther. Mexico Tramways 6 per cent. bonds, for example, are 4½ points down; which the 5 per cent. bonds are 3½ lower and the shares 1½. Mexican Light and Power Preferred at 89½ is 2 down, the 5 per cent. First Mortgage bonds have fallen 3, and the 5 per cent. Second Mortgage bonds a point. To what length the revolutionists may go in the way of wrecking property is the question that is causing considerable apprehension on this side. If they do not damage the assets to any extent, the current quotation of to-day will, six months hence, look exceedingly tempting; but it requires robust courage, not only to buy the securities, but even to suggest that, as speculative investments, they possess any attraction. The Latin-Canadian group, as a whole, is inclined to be dull.

The Mexico Tramways Company has convened a meeting next month for the purpose of raising the present ordinary share capital from 20 million dollars to 30 million dollars, as by this course the company could proceed to issue £1,200,000 three-year 6 per cent. secured Notes, convertible into ordinary shares at par during the currency of the Notes. The directors state that the operations of the Company, and those of the Mexican Light and Power Company, have not been seriously interfered with.

The Shawinigan Water and Power Company announces that it is prepared to receive tenders for the sale to itself of $62,000 of the issue of 5 per cent. Consolidated mortgage bonds due 1934.

Brazilian Traction shares keep fairly steady about 88. Sharp falls occurred in Anglo-Argentine Tramways Preference shares of both classes, on the pressure to sell a few hundred shares of each. There was a recovery to 4¾ in the First Preference, and to $4\frac{5}{16}$ in the second, leaving declines on the week of $\frac{1}{16}$ and $\frac{3}{16}$ respectively. United Electric Trams of Monte Video are better, both Ordinary and Preference moving up. Kalgoorlie 6 per cent. "B" Debenture was marked down 8 points to 10-20.

The Electricity Supply section has steadied, and there has been a slight improvement in County of London shares, the Ordinary picking up to 11⅞. Apart from this, however, the changes are insignificant.

In the Home Railway market, Metropolitans dropped at one time to 42, a fall of 2¼, on the denial given to the rumour that the company was going to be taken over by the Great Western Railway. The whole market, indeed, has been weak in consequence of the Royal Commission to inquire into the relations between the State and the railways. This was regarded as a plain hint of nationalisation; and, on the theory that public interest would dwindle more than ever while the inquiry is in progress, prices were put down smartly. Later on, it was pointed out that even nationalisation might prove a good thing for stockholders, and there was a general recovery, in the course of which Metropolitans hardened to 43¼, leaving off 1 lower on balance. Districts are flat at 31⅜, and East Londons have given way. With the exception of these changes, the various Electrical Railway stocks have moved but little. London United Tramways Debenture stock fell 2. British Electric Traction Preferred is again a point down, but the Company's 4½ per cent. Second Debenture improved to 78½.

The Telegraph market underwent further falls, but during the last day or two there has been a certain amount of recovery, though on balance the movements are against holders. Globe Ordinary and Preference are ¼ and ⅛ down respectively. West India and Panama fell to 2½. Commercial Cable Debenture is a point lower. The Eastern group eased off, to recover later. Amongst Telephones, United River Plates are ½ down. New York Telephone bonds lost ½, and American Telephone and Telegraphs are easier, both as regards the shares and the bonds. The National Telephone Company is going to pay a further £7 to holders of the Deferred stock, which will make in all £104 returned, with a prospect of a little more some two or three months hence, so that the final result of the liquidation will be rather better (or less bad) than at one time seemed likely.

The only feature in the manufacturing group is a rise of 3 points in Crompton Debenture, making 5½ points during the last fortnight, and there is still a steady demand for the stock. British Aluminium Ordinary lost part of their recent rise, recovering it, however, to-day (Tuesday). Rubber shares have gone ahead with a rush, particularly as regards the higher-priced issues. The price of the commodity itself is hardening, and there is a profound hope that the Rubber Growers' Association will be able to announce steps, within the next few days, that shall enable the industry to be put on a soundly profitable basis from the point of view of the producers.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations Oct. 28th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bournemouth & Poole, Ord.	10	6	5†	9½ — 10½	..	5 17 1
Do. 4½ % Pref.	10	4½	4½	8½ — 9½	..	4 14 9
Do. Second 6 % Pref.	10	6	6	10 — 10½	..	5 14 3
Do. 4½ % Deb. Stock	Stock	4½	4½	95 — 98	..	4 11 10
Brompton & Kensington, Ord.	5	10	9†	8½ — 9	..	5 11 1
Do. 7 % Cum. Pref.	5	7	7	8½ — 8⅝	..	4 1 2
Central Electric Supply, 4 % Guar. Deb.	100	4	4	94 — 97	..	4 2 6
Charing Cross, West End & City	5	5	5†	4½ — 5	..	5 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4 — 4½	..	5 0 0
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅜ — 3⅞	..	5 16 2
Do. Do. 4 % Deb.	100	4	4	90 — 92	..	4 7 0
Chelsea, Ord.	5	5	4†	4½ — 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	94 — 97	..	4 12 9
City of London, Ord.	10	9	6†	15⅜ — 16⅜	..	5 7 6
Do. 6 % Cum. Pref.	10	6	6	12⅛ — 13⅛	..	4 8 11
Do. 5 % Deb.	Stock	5	5	115 — 119	..	4 4 0
Do. 4½ % Second Deb.	100	4½	4½	99 — 101	..	4 9 1
County of London, Ord.	10	6	5†	11⅜ — 12⅛	+ ⅛	4 19 0
Do. 6 % Pref.	10	6	6	11⅛ — 12	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	102⅞ — 104⅛	..	4 6 2
Do. 4½ % Second Deb.	Stock	4½	4½	98 — 101	..	4 9 1
Edmundson's, Ord.	£3	..	..	⅜ — ⅝	..	Nil
Do. 6 % Cum. Pref.	5	6	6	4 — 4½	..	3 8 7
Do. 6 % Non-Cum. Pref.	5	..	..	1⅛ — 1⅜	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	80 — 83	..	5 8 5
Folkestone	5	6	6	4⅜ — 4⅞	..	6 3 1
Do. 5 % Cum. Pref.	5	5	5	4⅜ — 4¾	..	5 2 7
Do. 4½ % First Deb.	100	4½	4½	89 — 91	..	4 19 0
Hove	5	9	..	7⅞ — 8⅛ xd	..	5 10 9
Kensington & Knightsbridge, Ord.	5	8	8†	7⅞ — 8	..	5 0 0
Do. 4 % Deb.	Stock	4	4	88 — 91	..	4 7 11
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	74 — 78	..	5 15 5
London Electric, Ord.	3	2½	..	1⅜ — 1⅝	..	4 12 7
Do. 6 % Pref.	5	6	6	4⅝ — 5⅛	..	5 17 1
Do. 4 % First Mort. Deb.	Stock	4	4	90 — 93	..	4 6 0
Metropolitan	5	4	4†	3⅜ — 3⅞	..	5 3 3
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4¾	..	5 0 0
Do. 4½ % First Mort. Deb.	Stock	4½	4½	96 — 99	..	4 10 1
Do. 3½ % Mort Deb.	Stock	3½	3½	79 — 82	..	4 5 4
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98 —101 xd	—1	4 19 0
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	10 — 10⅜	..	5 11 7
Oxford	5	7	6†	5⅞ — 6⅜	..	5 9 10
St. James' and Pall Mall, Ord.	5	10	10†	8⅜ — 9⅛	..	5 8 1
Do. 7 % Pref	5	7	7	6⅞ — 7	..	5 0 0
Do. 3½ % Deb.	100	3½	3½	82½ — 85½	..	4 1 10
South London, Ord.	4	5½	..	2⅝ — 3⅛	..	7 0 9
Do. 5 % First Mort. Deb.	100	5	5	96 — 99	..	5 1 0
South Metropolitan, 7 % Pref.	1	7	7	1⅛ — 1⅛	..	6 1 3
Do. 4½ % First Deb. Stock	100	4½	4½	93 — 96	..	4 13 9
Urban, Ord.	£1	Nil	..	⅛ — ⅜	..	..
Do. 5 % Cum Pref.	5	3	..	2⅜ — 2⅝	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	83 — 86	..	5 4 8
Westminster, Ord.	5	10	10†	8⅛ — 8⅜	..	5 14 3
Do. 4½ % Cum Pref.	5	4½	4½	4⅛ — 4⅜	..	4 7 10

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6†	4⅞ — 5⅛	..	5 17 1
Calcutta, Ord.	5	7½	..	7⅛ — 7⅜	..	5 9 8
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 15 3
Calgary Power, 1st Mort. Bds.	100	5	5	91 — 93	..	5 7 6
Canadian Gen. El. Com.	$100	7	7†	105 —110	..	6 7 3
Do. 7 % Pref.	$100	7	7	117 —122	..	5 14 9
Cordoba Lt., Power and T, Ord.	1	5	..	⅞ — 1⅛	..	6 8 1
Do. 5 % Deb.	100	5	5	91 — 93	..	5 7 6
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	90½ — 92½	..	6 9 9
Elec. Supply Victoria, 6 % 1st Mort. Deb.	100	5	5	87½ — 90½	..	5 10 6
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	92 — 94	..	5 6 5
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	⅜ — ½	..	Nil
Do. 6 % Pref.	1	6	6†	⅞ — 1 xd	..	11 5 8
Kaministiquia Power, 5 % G. Bs.	$500	5	5	102½ —104½	+ ½	4 15 8
Madras, Ord.	5	Nil	..	1¼ — 1⅝	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	103 —106	..	4 14 4
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	70 — 75	..	6 13 4
Mexican Lt. & Power, Common	$100	4	4	55 — 60 xd	..	6 13 4
Do. 7 % Cum. Pref.	$100	7	7	87 — 92	—2	7 12 2
Do. 5 % 1st Mort. Gold Bds.	..	5	5	79 — 83	—3	6 0 6
Do. 5 % 2nd Mort. Bonds	100	5	5	70 — 74	—1	6 15 2
Monterey Rly., Light & Power, 5 % 1st Mort. Deb.	100	5	5	72 — 75	..	6 13 4
Montreal, Lt., H. and Power	$100	9	10†	215 —220	..	4 10 11
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5a	5a	15 — 25	..	..
River Plate, Ord.	Stock	10	..	207 —217	..	4 8 0
Do. 6 % Non-Cum. Pref.	Do.	6	6	102 —107	..	5 9 1
Do. 5 % Deb. Stock	Do.	5	5	97⅛ — 99½	..	4 19 6
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	99 —101	..	4 9 4
Shawinigan Water, Capital	$100	5½	6†	133 —138 xd	+3	4 0 11
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	105 —107	..	4 13 6
Do. 4½ % Per. Deb.	Stock	4½	4½	100⅛ —102½	..	4 7 10
Toronto Power, 4½ % Deb.	Do.	4½	4½	97 —100	..	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	90½ — 92½	..	5 8 1
Victoria Falls Power, Pref.	1	6	6	13/16 — 15/16	..	6 8 0
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103 —105	..	5 14 3

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4½	..	6¾ — 7⅜	..	6 2 0
Do. 5 % Deb. Red.	Stock	5	5	95 — 97	..	5 3 1
American Telep. & Teleg., Cap.	$100	8	8	124 —126	—1	6 7 0
Do. Collat. Trust	$1000	4	4	91 — 93	—1	4 6 0
Anglo-American Telegraph	Stock	3	3	62 — 65 xd	..	4 12 4
Do. 6 % Pref.	Do.	6	6	104½ —105½ xd	..	5 14 0
Do. Def.	Do.	80/-	..	23½ — 23⅞	..	6 6 4
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	5	8	..	7⅝ — 7⅞	..	5 5 7
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	79 — 81	—1	4 18 9
Cuba Telegraph	10	6	6†	8½ — 9½ xd	..	6 9 9
Do. 10 % Pref.	10	10	10	14½ — 15½	— ½	6 11 2
Direct Spanish Telegraph, Ord.	5	4	4	3½ — 3⅞	..	5 6 8
Do. 10 % Cum. Pref.	5	10	..	6½ — 7½	..	6 12 0
Direct United States Cable	10	4	4†	6⅝ — 7⅛	..	5 12 3
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7	127 —130 xd	..	5 7 8
Do. 8½ % Pref. Stock	Do.	8½	8½	75— 77 xd	..	4 10 11
Do. 4 % Mort. Deb.	Do.	4	4	96½ — 98½	..	4 1 3
Eastern Extension	10	7	7	12½ — 12⅝	..	5 9 10
Do. 4 % Deb.	Stock	4	4	94 — 96	..	4 3 4
East and S. Africa Tel. 4 % Mt. Db Mauritius Sub.	25	4	4	99½ —101½	..	3 18 10
Globe Telegraph and Trust	10	6	6†	10⅞ — 11⅞	— ⅛	5 6 8
Do. 6 % Pref.	10	6	6	11⅞ — 12⅜	— ⅛	4 18 0
Great Northern Telegraph	10	20	5†	81 — 83	+2	6 1 3
Indo European Telegraph	25	13	..	67 — 69	..	5 10 2
Mackay Companies Common	$100	5	5	82 — 86	..	5 17 8
Do. 4 % Cum. Pref.	$100	4	4	67 — 70	..	5 14 4
Marconi's Wireless Telegraph	1	20	..	3⅜ — 3⅝	— ⅛	5 6 8
Do. 7 % Cum. Partic. Pref.	1	17	..	2⅜ — 2⅝	— 1/16	5 8 9
Monte Video Telephone, Ord.	1	6	6	1⅛ — 1⅜	..	5 13 0
Do. 5 % Pref.	1	5	5	⅜ — ⅝	..	5 14 3
New York Telep., 4½% Gen. Bnds.	100	4½	4½	98½ — 99½	— ½	4 10 6
Oriental Telep. and Elec.	1	10	..	1¾ — 2	+1/32	5 0 0
Do. 6 % Cum. Pref.	1	6	6	1⅜ — 1½	..	4 16 0
Do. 4 % Red. Deb.	Stock	4	4	86 — 88	..	4 10 11
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	96½ — 98½	..	4 1 3
Reuter's	10	10	10†	9⅝ — 10½	..	9 17 6
Submarine Cables Trust	Cert.	6	6	121 —124 xd	..	4 16
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	95 — 97	..	4 12
United River Plate Telephone	5	8	6†	6⅞ — 6⅞	— ⅛	5 16
Do. 5 % Cum. Pref.	5	5	5	5 — 5⅛	..	4 11
West Coast of America	2½	2½	..	1⅞ — 1⅞	..	4 8
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	94 — 97	..	4 2
West India and Panama Teleg.	10	1½	..	2⅜ — 2⅝	— ⅛	4 15
Do. 6 % Cum. 1st Pref.	10	6	6	9⅝ — 10⅜	..	5 18
Do. 6 % Cum. 2nd Pref.	10	6	6	9½ — 9⅞	..	6 3
Do. 5 % Debs.	100	5	5	98 —100	—1	5 0
Western Telegraph, Ltd.	10	7†	7	12⅞ — 13⅛	+ ⅛	5 4
Do. 4 % Debs.	Stock	4	4	94 — 96	..	4 3
Western Union 4½ % Fdg. Bonds	$10.0	4½	4½	92 — 95 xd	..	4 14

* Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. 8s. in Funded Dividend Certs.

Continued on next Page.

SHARE LIST OF ELECTRICAL COMPANIES.—*(Continued.)*

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations Oct. 28th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bath Tramways, Pref. Ord.	1	Nil	..	5/16 — 7/16	..	Nil
Do. 5 % Pref.	1	5	5	13/16 — 15/16	..	6 8 0
Do. 4½ % Deb.	100	4½	4½	70 — 75	..	6 0 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	12½ — 14½	..	..
Do. Do. Deferred	100	..	..	4 — 6	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	86 — 89	..	6 14 10
Do. 7 % Non-Cum. Pr'f.	100	8	..	48 — 51	—1	5 17 8
Do. 5 % Perp. Deb.	100	5	5	91 — 94	..	5 6 5
Do. 4½ % 2nd Deb.	100	4½	4½	77 — 80	+1	5 12 6
Central London Railway, Ord.	100	8	8	61 — 66	..	4 11 0
Do. Gtd. Assented	100	..	4	78 — 80	..	5 0 0
Do. Pref.	100	4	4	70 — 75	..	5 6 8
Do. Gtd. Assented	100	..	4	81 — 83	..	4 16 3
Do. Def.	100	2	..	60 — 65	..	3 1 7
Do. Gtd. Assented	100	..	4	78 — 80	..	5 0 0
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	98 —100	..	5 0 0
Do. Do. 1896	100	5	5	98 —100	..	5 0 0
Do. Do. 1901	100	5	5	97 — 99	..	5 1 0
Do. Do. 1903	100	5	5	96 — 98	..	5 1 9
Do. 4 % Deb.	100	4	..	93 — 95	..	4 4 3
Hastings Trams, 6 % Pref.	1	6	6†	½ — ¾	..	8 0 0
Do. 4½ % Deb.	100	4½	4½	66 — 71	..	6 6 9
Isle of Thanet Trams, 5 % Pref.	5	2½	..	2 1/16 — 2 3/16	..	4 17 7
Do. 4 % Deb.	100	4	4	73 — 78	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	77 — 81	..	6 3 5
London and Suburban, Ord.	1	..	..	½ — ¾	..	..
Do. Do. 5 % Cum. Pref.	1	..	5†	1/16 — 1/8	..	..
Do. Do. 4½ % 1st Deb.	100	4½	4½	77 — 82	— ½	5 9 9
London Elec. Railways, 4 % Deb.	100	4	4	91 — 93	..	4 6 0
London United Trams, 4 % Deb.	100	4	4	58 — 62	—2	6 9 1
Metropolitan Railway Consol.	100	1⅞	1½†	43 — 43½	—1	3 14 9
Do. Surplus Lands	100	2⅜	2½†	59 — 61	..	4 10 2
Do. 3½ % Deb.	100	3½	1 ⅝	84 — 85	..	4 2 4
Do. 3½ % Pref.	100	3½	3½	78 — 80	..	4 7 6
Do. 3½ % Con. Pref.	100	3½	3½	76 — 78	..	4 9 9
Metropolitan District Ord.	100	Nil	..	31½ — 32	—1½	Nil
Do. 6 % Deb.	100	6	6	136 —139	..	4 6 4
Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Do. 4 % Prior Lien	100	4	4	95 — 97	..	4 2 6
Do. 4½ % First Pref.	100	4½	4½	83 — 84	..	5 7 2
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	82 — 86	..	5 4 8
Do. 5 % Deb.	100	5	5	86 — 89	..	5 12 0
Potteries, Ord.	1	3½	..	7/16 — 9/16	..	..
Do. 5 % Pref.	1	5	5	7/16 — 9/16	..	7 5 6
Do. 4½ % Deb.	100	4½	4½	82 — 85	..	5 6 5
South Metro. Trams, 6 % Pref.	1	6	6†	⅜ — ½	..	8 0 0
Do. 4 % Deb.	100	4	4	68 — 72	..	5 11 1
Underground Elec. Railways	10	..	..	3⅜ — 4	..	Nil
Do. "A"	1/-	..	..	1/16 — 3/16	..	Nil
Do. 6 % First Cum. Inc. Deb.	100	6	6	110 —113	..	5 8 1
Do. 4½ % Bonds	100	4½	4½	99 —101	..	4 9 1
Do. 6 % Income	100	6	6	89 — 90	..	6 13 4
Yorkshire (West Riding), Ord.	5	Nil	..	⅛ — ¼	..	Nil
Do. 6 % Pref.	5	3 3/10	1½†	3⅜ — 3¾	..	..
Do. 4½ % Deb.	100	4½	4½	81 — 85	..	5 6 0

ELECTRIC RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4⅝ — 4⅞	— 1/16	5 12 10
Do. 2nd Pref.	5	5½	5½	4 7/16 — 4 9/16	— 1/16	6 3 11
Do. 4 % Deb.	100	4	4	91 — 93	..	4 6 0
Do. 4½ % Deb.	100	4½	4½	96½ — 98½	..	4 11 5
Do 5 % Deb.	100	5	5	98½ —100½	..	4 19 6
Auckland Trams, 5 % Deb.	100	5	5	100 —101	..	4 18 0
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅜ — 11½	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	94 — 96	..	4 13 9
Do. 5 % 2nd Deb.	100	5	5	96 — 99	..	5 1 0
Brazilian Traction, Light and Power	$100	6	6†	87 — 89	—1	6 14 10
Brisbane Trams Invt., Ord.	5	8	8†	7½ — 7⅝	..	5 3 3
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 10 11
Do. 4½ % Deb.	100	4½	4½	99 —102	..	4 8 3
B. Columbia Elec. Rly., Def.	100	8	8†	120 —124	..	6 9 1
Do. Pref. Ord.	100	6	6	108 —112	—1	5 7 2
Do. 5 % Pref.	100	5	5	99 —102	..	4 18 0
Do. 4½ % 1st Mort. Deb.	40	4¼	4½	97 —100 xd	..	4 10 0
Do. 4½ % Vancouver Deb.	100	4½	4½	100 —104	..	4 6 7
Do. 4½ % Con. Deb.	100	4½	4½	89 — 92	..	4 12 5
Calcutta Trams, Ord.	5	7½	6†	6 — 6⅛ xd	..	5 15 5
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	96 — 99	..	4 11 0
Cape Electric Trams	1	5	..	1/16 — 1/8	..	6 8 1
City Buenos Aires Trams (1904)	5	5†	5	5⅛ — 5⅜	..	4 18 0
Do. 4 % Deb.	100	4	4	92 — 97	..	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	90½ — 94½	..	5 5 10
Havana Elec. Rly., 5 % Bonds	$1000	5	5	94½ — 98½	..	5 1 6
Kalgoorlie Elec. Trams	1	Nil	..	3/32 — 5/32	..	Nil
Do. 5 % A Deb.	100	5	5	85 — 90	..	5 11 1
Do. 6 % B Deb.	100	3	..	10 — 20	—8	..
La Plata Elec. Trams, Ord.	1	..	..	3/32 — 1/2	..	..
Do. Pref.	1	4½d.	6	5/16 — 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	6	6†	1 — 1½	..	4 16 1
Do. 6 % Pref.	1	6	6	1⅜ — 1 3/16	..	5 1 0
Do. 5 % Deb.	100	5	5	91 — 96	..	5 4 2
Madras Elec. Tr., 6 % Cum. Pref.	5	6	6	4¾ — 5⅛	..	5 17 1
„ Elec. Tr. (1904), Deb.	100	5	5	101 —103	..	4 17 1
Manaos Trams & Lt., 1st Deb.	100	5	5	87 — 89	..	5 12 4
Manila Elec. R. and Ltg., Bonds	$1000	5	5	96½ — 98½	— ⅛	5 1 6
Mexico Trams Com	$100	7	7	79 — 83	—1⅛	8 8 8
Do. Gen. Con. 5 % Bonds	..	5	5	77½ — 82½	—3½	6 1 3
Do. 6 % Bonds	100	6	6	84 — 88	—4½	6 16 4
Para Elec. Rlys. & Lt., Ord.	5	10	10†	5⅞ — 6⅛	..	8 2 8
Do. 6 % Pref.	5	6	6	4¾ — 5⅛	..	5 17 1
Do. 5 % 1st Deb.	100	5	5	97 — 99	..	5 1 0
Perth (W.A.) Elec. Tr., Ord.	1	5½	..	1⅛ — 1⅜	..	4 0 0
Rangoon El. Tr. & Sup., Pref.	5	6	6	5 — 5⅛	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	94 — 96	—1	4 13 9
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	98½ —100½	..	4 19 6
Do. 5 % Mort. Bonds	100	5	5	88½ — 90½	..	5 10 6
Sao Paulo Tram., Lt. and P. 5 % 1st Deb.	$100	5	5	100 —103	..	4 16 2
Singapore Trams, 5 % Deb.	100	5	5	86 — 90	..	5 11 1
Southern El. Tr. B.A., 5 % Deb.	100	5	5	93 — 95	..	5 5 3
Un. Elec. Trams Monte Video	5	7	7	5 — 5⅛	+ ⅛	6 10 3
Do. 6 % Pref.	5	6	6	5 — 5⅛	+ 1/16	5 11 7
Do. 5 % 1st Deb.	100	5	5	96 — 99	—1	5 1 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	98½ —100½	..	4 9 7

MANUFACTURING COMPANIES.

Aron, Ord.	1	7	..	3/16 — 1/3	..	8 12 4
Do. 6 % Pref.	1	6	6	3/4 — 15/16	..	7 13 4
Babcock & Wilcox	1	16	..	2⅝ — 3	— 1/16	5 6 8
Do. Pref.	1	6	6	1 5/16 — 1 7/16	..	4 3 6
British Aluminium, Ord.	1	..	..	1 1/16 — 1 1/8	..	..
Do. 6 % Cum. Pref.	1	6	6	1 1/16 — 1 1/8	..	6 8 0
Do. 5 % Prior Liens Debs.	100	5	5	93 — 96	..	5 4 2
Do. Deb. Stk.	100	5	5	85½ — 87½	..	5 14 3
B.I. & Helsby Cables	5	10	..	8 — 8⅛	— ⅛	5 17 8
Do. Pref.	5	6	6	6 — 6⅛	..	4 12 4
Do. Deb.	100	4½	4½	100 —103	..	4 7 5
British Thomson-Houston, Deb.	100	4½	4½	92 — 95	..	4 14 9
British Westinghouse, Pref.	3	Nil	..	1/16 — 1⅛	..	Nil
Do. Deb.	100	4	4	66 — 69	..	5 15 11
Do. 6 % Prior Lien	100	6	6	100 —103	..	5 16 6
Browett, Lindley, Ord.	1	..	..	2/- —3/-	..	Nil
Do. Pref.	1	..	..	8/- —8/6	..	Nil
Brush, 7 % Pref.	2	Nil	..	0 — ¼	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	70⅛ — 75⅛	..	6 12 5
Do. 4½ % Deb.	100	4½	4½	5⅝ — 40⅝	..	11 2 2
Do. 4½ % Second Deb.	100	4½	4½	3 — 27	..	16 13 4
Callender's Cable	5	15	..	1 — 11⅜	..	6 7 8
Do. Pref.	5	5	5	5 — 5¼	..	4 15 3
Do. Deb.	100	4½	4½	96 — 99	..	4 10 6
Castner-Kellner	1	20	..	31⅜ — 32⅝	..	5 1 7
Do. Deb.	100	4½	4½	102 —105	..	4 5 9
Crompton & Co., Deb.	100	5	..	60 — 65	+3	7 13 10
Dick, Kerr	1	Nil	..	1/16 — 3/16	..	..
Do. Pref.	1	6	6	2⅝ — 2¾ xd	..	7 2 2
Edison & Swan, A, £8 paid	5	Nil	..	0 — ⅛	..	Nil
Do. fully paid	5	Nil	..	1¼ — 1½	..	Nil
Do. 4 % Deb.	100	4	4	58 — 62	..	6 9 1
Do. 5 % Second Deb.	100	5	5	63 — 68	..	7 7 1
Electric Construction	1	5	..	1/16 — 1/8	..	7 5 6
Do. Pref.	1	7	7	1/16 — 1 1/16	..	6 11 9
Greenwood & Batley, Pref.	10	7	7	6¾ — 7¼	..	9 13 2
Do. Deb.	100	5	..	92 — 94	..	5 4 2
General Electric, 6 % Pref.	10	6	6	9½ — 10¼	..	5 14 3
Do. Deb.	100	4	4	88 — 93	..	4 6 0
Henley's, Ord.	5	15	10†	12¼ — 13	..	5 15 5
Do. Pref.	5	4½	4½	4 1/16 — 5 1/16	..	4 8 11
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
India-Rubber, G. & T.	10	7½	..	13½ — 14½	..	5 5 8
Do. Pref.	10	5	5	9⅝ — 10⅜	..	4 11 9
Telegraph Construction	12	20	5†	37 — 39	..	6 1
Do. Deb.	100	4	4	96 — 98	..	4 8
Willans & Robinson, 4 % 1st Mort. Deb.	100	4	4	55 — 60	..	6 13 4

* Unless otherwise stated all shares are fully paid. † Interim dividend.

Bank rate of Discount 5 per cent., October 2nd, 1913.

TRADE STATISTICS OF NEW ZEALAND.

The following figures, showing the imports of electrical and similar goods into New Zealand in 1912, are taken from the recently issued official trade figures. Details for 1911 are added for purposes of comparison, and notes of any increases or decreases are added :—

	1911. £	1912. £	Inc. or dec. £
Asphalt.—			
From United Kingdom ...	2,000	6,000	+ 4,000
„ Other countries ...	1,000	4,000	+ 3,000
Total ...	3,000	10,000	+ 7,000
Leather belting.—			
From United Kingdom ...	4,000	4,000	—
„ Other countries ...	2,000	1,000	— 1,000
Total ...	6,000	5,000	— 1,000
Belting other than leather.—			
From United Kingdom ...	27,000	26,000	— 1,000
„ Australia	2,000	1,000	— 1,000
„ United States ...	3,000	2,000	— 1,000
„ Other countries ...	2,000	2,000	—
Total ...	34,000	31,000	— 3,000
Engine packing.—			
From United Kingdom ...	12,000	13,000	+ 1,000
„ Australia	2,000	2,000	—
„ Other countries ...	2,000	5,000	+ 3,000
Total ...	16,000	20,000	+ 4,000
Rubber goods.—			
From United Kingdom ...	3,000	4,000	+ 1,000
„ Australia	5,000	10,000	+ 5,000
„ Other countries ...	2,000	2,000	—
Total ...	10,000	16,000	+ 6,000
Scientific instruments.—			
From United Kingdom ...	6,000	8,000	+ 2,000
„ Other countries ...	2,000	5,000	+ 3,000
Total ...	8,000	13,000	+ 5,000
Rails.—			
From United Kingdom ...	154,000	153,000	— 1,000
„ Belgium	6,000	5,000	— 1,000
„ Other countries ...	3,000	3,000	—
Total ...	163,000	161,000	— 2,000
Telegraph and telephone wire, iron.—			
From United Kingdom ...	11,000	7,000	— 4,000
Electrical machinery.—			
From United Kingdom ...	177,000	274,000	+ 97,000
„ Australia	23,000	33,000	+ 10,000
„ Germany	16,000	27,000	+ 11,000
„ United States ...	31,000	39,000	+ 8,000
„ Belgium	4,000	7,000	+ 3,000
„ Other countries ...	6,000	17,000	+ 11,000
Total ...	257,000	397,000	+ 140,000
Steam engines.—			
From United Kingdom ...	8,000	29,000	+ 21,000
„ United States ...	1,000	—	— 1,000
„ Other countries ...	—	2,000	+ 2,000
Total ...	9,000	31,000	+ 22,000
Gas and oil engines (except for motor-cars).—			
From United Kingdom ...	105,000	149,000	+ 44,000
„ Australia	3,000	6,000	+ 3,000
„ United States ...	20,000	22,000	+ 2,000
„ Other countries ...	2,000	3,000	+ 1,000
Total ...	130,000	180,000	+ 50,000
Boilers.—			
From United Kingdom ...	8,000	6,000	— 2,000
„ Other countries ...	1,000	—	— 1,000
Total ...	9,000	6,000	— 3,000
Other machinery (except agricultural, printing, sewing, textile, &c.).—			
From United Kingdom ...	82,000	76,000	— 6,000
„ Australia	10,000	9,000	— 1,000
„ Germany	2,000	3,000	+ 1,000
„ United States ...	25,000	20,000	— 5,000
„ Other countries ...	3,000	6,000	+ 3,000
Total ...	122,000	114,000	— 8,000
Mining machinery.—			
From United Kingdom ...	22,000	13,000	— 9,000
„ Australia	6,000	5,000	— 1,000
„ Germany	1,000	1,000	—
„ United States ...	11,000	7,000	— 4,000
„ Other countries ...	1,000	—	— 1,000
Total ...	41,000	26,000	— 15,000
Meters: Water, gas and electricity.—			
From United Kingdom ...	27,000	27,000	—
„ Australia	2,000	1,000	— 1,000
„ United States ...	2,000	2,000	—
„ Other countries ...	1,000	—	— 1,000
Total ...	32,000	30,000	— 2,000
Railway and tramway plant.—			
From United Kingdom ...	43,000	38,000	— 5,000
„ Australia	2,000	2,000	—
„ Other countries ...	1,000	5,000	+ 4,000
Total ...	46,000	45,000	— 1,000
Lamps and lanterns.—			
From United Kingdom ...	33,000	35,000	+ 2,000
„ Germany	11,000	15,000	+ 4,000
„ United States ...	15,000	15,000	—
„ Other countries ...	7,000	7,000	—
Total ...	66,000	72,000	+ 6,000

ELECTRICAL EXHIBITION IN GLASGOW.

The Electrical Exhibition which was inaugurated in Glasgow on Thursday afternoon of last week, and which is being held under the ægis of the Corporation of the city, gives promise of being a pronounced success. In a "foreword" embodied in the catalogue of exhibits and exhibitors the promoters explain that the success which had attended the Smoke Abatement Exhibitions in the city within recent years had encouraged them to proceed with this purely electrical venture. The efforts of the promoters were seconded and supported by the British Electrical and Allied Manufacturers' Association, and altogether some 80 stands have been grouped together and the accommodation of the Zoo Buildings, New City Road, Glasgow, has been taxed to the utmost. It is of interest to note that the stands have been erected on a uniform basis by the Corporation, and the appearance of the Exhibition has been enhanced by the fact that an attractive scheme in white, grey and pink has been carried out. Mr. James M. Freer has acted as manager and he has been assisted by Mr. W. W. Lackie, electrical engineer to the Corporation, Bailie W. B. Smith, convener of the Electricity Committee, and the individual members of that progressive Committee.

In the "Foreword" Mr. Lackie gives interesting facts and figures illustrative of the development which Glasgow's electricity department has made. Starting in a small way 21 years ago, with a plant of 500 H.P., the department has now in its several stations plant totalling 50,000 H.P., while a further 17,000 H.P. is on order. Ground has been acquired for a new station on the banks of the River Clyde at Dalmarnock, with an ultimate capacity of 130,000 H.P., and plans are in preparation. The Exhibition is wide in its scope, and a well-concentrated effort has been made by exhibitors and promoters working harmoniously together, to demonstrate the uses of electricity. The Exhibition abounds with appliances illustrating the efficacy of electrical illumination for the streets, the home, the factory, the office and for business purposes generally. Many types of electric motors are shown for use in shipyards, engineering shops and factories, and for driving all kinds of machinery. Then there is a wealth of plant for generating electricity in country residences, for the equipment of collieries, and for use on board ship. Telephone installations for all classes of service are to be seen on many stands, while wiring systems, cables, switchboards, elevators, refrigerating machines and electric heaters are open for inspection.

If, however, there is one section more than another in which the Exhibition may be said to be specially attractive to the general public, it is in apparatus for heating, cooking and other domestic uses. In Glasgow the rate for supply for domestic use has been reduced to ½d. per unit, so that the Corporation's electricity department are hopeful, as a result of the Exhibition, that their revenue from this branch will be considerably augmented. Other domestic appliances displayed include vacuum cleaners, clothes washers, electric irons, knife-cleaners, and electric tea and coffee pots. Appended we give notes on a number of stands in the Exhibition.

Messrs. Siemens Bros. & Co., Ltd., have two stands, which are replete with their many specialities. The "Melda" water pump is on view, as well as the "Stannos" system of wiring, while there is a large collection of telephones, batteries, lighting sets specially suited to country residences, "Zed" fuses, medical apparatus and motors. Messrs. Siemens, it is understood, are taking advantage of this occasion to demonstrate to the owners of country houses that the generating of electric current can be carried out privately

at a cost of slightly over 1d. per unit. There is also shown in operation on these stands a "Siemens-Aster" oil engine set, suitable for use with petrol or paraffin fuel, as well as all classes of cable suitable for bell, lighting, power, submarine and telephone work.

The British Insulated and Helsby Cables, Ltd., have on view the latest type of "Prescot Welder," which has created an exceptional amount of interest and attention since the opening of the Exhibition. Amongst the cable samples shown—and these are numerous—is what is regarded as an interesting development in the shape of an E.H.T. cable, with special strip for detecting the presence of moisture. Gate-end boxes and channel trolley wires of special interest to mining engineers and tramway managers respectively, have been commanding attention on this stand, while Mordey-Fricker meters and new Prescot cable units with porcelain insulation have also been displayed.

The electricity department of Glasgow Corporation have established a useful information bureau at Stand No. 1. Here Mr. M. A. S. Davies, mains department, and other officials, are in constant daily attendance to answer inquiries relative to the supply of electricity from the Corporation. A map, showing the position of existing mains is exhibited, and terms can be quoted, if need be, for the extension of mains with a view to giving a supply to premises where current is not at present available. In addition, all other requisite information, including methods of charging and approximate annual costs, can be readily obtained. Further, the electricity department show at this stand a window of ordinary dimensions lighted by systems suitable for various trades. This, it is felt, will prove popular with merchants particularly keen on having a bright and attractive window display. An automatic device switches in the various systems and turns a drum giving information as to the cost of installing and current costs for one year. Heaters and fans for use in windows for the dissipation of frost and moisture are also on view.

An exceedingly bright and interesting display is that of the Edison & Swan United Electric Light Co., Ltd., Ponder's End. On this stand chief interest undoubtedly centres round the Royal Ediswan drawn-wire metal filament lamp. There are also accessories manufactured at the firm's London works, which include many patterns of holders, adaptors, ceiling roses, plugs, fuses and the popular house service ironclad switch, which is shown both double and triple-pole. Space is allotted to ship, mill and colliery fittings, while specimens are shown of Ediswan heavy service switchgear, including the "W" type circuit-breaker in 1,000 and 2,000 amperes, the "E" pattern breakers, and the latest pattern oil switch. Types of Ediswan heaters (Bastian and Dowsing patents) are also on view, including the Royal heater, which is establishing for itself a measure of popularity.

So far as the electrical contractors are concerned, an innovation has taken place this year, and 18 firms, who are connected with the Glasgow Branch of the Electrical Contractors' Association of Scotland, are showing collectively at Stand No. 61. It is a most attractive display, and the keynote is variety, both of electrical materials and apparatus for lighting, heating, cooking and power. The exhibit reflects great credit on the Committee who have been entrusted with the arrangement of the stall—namely, Messrs. Allan, Primrose, Lindsay and Wright. The exhibiting firms are:—Anderson & Munro, Ltd.,; Arthur, Allan & Ure; Bennett & Rutherford; Dow, William; Grindlay, Ross & Co.; Haddow & Co.; Hutcheson, Andrew; Johnston, Park & Co.; Lindsay, Alexander; Lowdon Bros. & Co.; Malcolm & Allan, Ltd.; Martin & Co., W. C.; Meighan, James, & Son; M'Whirter, Wm., & Son; Potter & Co.; Primrose and Primrose; Underhill & Ritchie; Woodward & Co.

The British Electric Plant Co., Alloa, are exhibiting several of their specialities in connection with colliery equipment. They have, in recent years, made a feature of high and low lift turbine pumps, and they are showing one of their standard D4 size pumps direct coupled to one of their special A.C. motors. This motor is specially adapted for work in mines, and the whole fitting is very compact. The output of the pump is 400 gallons per minute, against a 300-ft. head when running at a speed of 1,500 R.P.M. The company have also developed turbine pumps for boiler feed purposes. A complete set of pump impellers are shown mounted on the shaft, the unique feature being that the whole shaft, where it comes into contact with the liquid, is protected by bronze sleeves. The B.E.P. Co. also stage one of their new design of D.C. motors, suitable for pipe ventilation, which has been specially fitted for use in collieries where fresh air can be provided for the motor. Another exhibit is a 20-H.P. single drum haulage with post brake of substantial nature. This gear is fitted with a new mining type D.C. motor with drip-proof cover.

Messrs. Fraser & Borthwick, Glasgow, have at their stand (No. 50) an interesting display of electric light fittings, including the latest designs of Eye-rest system of indirect illumination with Mazda drawn-wire lamps. A comprehensive line of heating and cooking devices with Calorite element is shown. An interesting exhibit on the stand is an automatic starting rheostat of the contactor type.

Mr. David Martin, Glasgow, as representative for Messrs. A. Reyrolle & Co., Ltd., has forward many samples of Reyrolle switchgear of the lighter types. As agent, too, for the Skefko Ball-Bearing Co., Ltd., he has on view numerous examples of patent self-aligning double row ball bearings. The St. Helen's "cab tire" cable is also conspicuously displayed on the stand.

Messrs. James Keith & Blackman Co., Ltd., have a large assortment of steel plate fans as well as a model of a Keith patent mine-ventilating fan (double inlet reversible type). There is further to be seen a portable forge with an electric blower attached.

The Leskole Co. Ltd., have on view at Stand No. 3 a selection of electric distance thermometers, thermo-electric pyrometers, optical pyrometers, steam meters, gauges and mercury thermometers.

Messrs. Simplex Conduits, Ltd., Birmingham, have quite a pleasing show. Their exhibit partly consists of the various component parts of the Simplex steel conduit system of electric light and power wiring, and all the more important accessories and fittings used in conjunction with this system are attractively displayed. An item of outstanding interest at this stand is the "Plexsim" cooker. Demonstrations of cooking by this outfit are given at frequent intervals.

Messrs. G. St. John Day, Ltd., Oldham, have a stand fully occupied with their specialities in "Mumps" patent lampholders. Demonstrations are given.

One of the best-appointed stands in the Exhibition is that of the Carron Co., of Carron. They have on view an extensive and admirably varied range of electrical cooking and heating appliances. Examples are shown of the heavier type of apparatus usually associated with large hotel and restaurant equipment, and the exhibits clearly indicate that the Carron Co. are fully alive to the possibilities in this direction. The attendants at the stands are making a liberal distribution of the appropriately-titled brochure "A Touch of the Switch Does It."

Mr. John D. Mackenzie, Glasgow, is responsible for the exhibits on Stand No. 63. There he has for inspection the many specialities of Spagnoletti, Ltd., London; the Wardle Engineering Co. Ltd.; the Crittal Manufacturing Co., Ltd.; and the Crittal Steel Furniture Co., Ltd.—firms for whom he does business as a representative in Glasgow.

Messrs. W. Naughton & Watson, Glasgow, who specialise in electric motors and the application of these to every type of machinery, show how electrical energy can be adapted with profit and advantage to bakers' whisk and dough-mixing machines, manufacturers' sewing machines, dairy cream separators, wood-working and meat-cutting machinery. They further exhibit a number of drills, fans, and electric light fittings generally for house and factory installations.

The Record Electrical Co., Ltd., of London and Manchester, show measuring instruments of all descriptions, and automatic circuit-breakers and apparatus suitable for commercial and laboratory purposes.

Messrs. Bonham, Scott & Co., Ltd., Anderston, Glasgow, exhibit a series of printing machines, all of which are controlled by motors and controllers supplied by the Adnil Electric Co., Ltd., London. Messrs. Waite & Savile, Ltd., Otley; Messrs. Elliott & Co. (Otley), Ltd., and Messrs. Aird & Coghill, Ltd., Glasgow, have co-operated with Messrs. Bonham, Scott & Co., Ltd., Glasgow, in securing the exhibits for this stand.

The Morgan Crucible Co., Ltd., sole manufacturers of Morganite and Battersea carbon brushes, have quite an elaborate display at their stand. Morganite packing rings for steam turbine glands, over-pressure discharge apparatus, and carbon powder resistances for lightning arresters, are included amongst the exhibits.

Messrs. Veritys, Ltd., are responsible for a varied show of Aston motors, fans, starters, regulators and dimming switches. One of the enclosed arc lamps exhibited is capable of burning 400 hours with one trimming. On the stand, there is a big array of electrical fittings, while the radiators and heating and cooking apparatus displayed is such as to command more than casual attention.

Messrs. Ferranti, Ltd., are giving prominence on their stand to electrical fires and cooking appliances generally. The display is quite an imposing one. House service meters, electrical measuring instruments, and detail switchgear also find a place in the exhibit.

Messrs. Dexine, Ltd., at Stand 22, give pride of place to the "Dexine" insulator. Car-pole insulators, sleeves, bobbins, brushes, switch handles, &c., are amongst other items of electrical interest shown.

A stand is occupied by the Electric Appliances Co., Ltd., London, in which they set out to advantage the Imperial vacuum suction cleaner.

Various types of A.S. refrigerating machines are advantageously displayed on Stand No. 24 by the Audiffren Singrum Refrigerating Machines, Ltd., of London.

A formidable show of the firm's well-known alloys is made by Callender's Cable and Construction Co., Ltd., while no effort has been spared to keep conspicuously to the front specimens of die cast white metal bearings for motor-car work. At the stand Callender's saloon windows are shown under conditions permitting of the application of hydraulic pressure. Examples of the firm's pumps for hydraulic, vacuum, high and low pressure air working are presented for inspection and the arrangement of the stands is such as permits of Callender's numerous specialities being exhibited to the greatest possible advantage.

Adjoining the space set apart for the Callender's Co. are to be seen the Gese patent electric pulley block and the Marshall patent electric hoist—the manufactures of the Electric Pulley Block Co., Ltd.

Messrs. Richard Pape, Ltd., Belvedere, and the Kalbitum Paint Co., Ltd., Belvedere, also make an attractive display at this point with their wares.

Messrs. Malcolm Campbell, Ltd., confectioners and toffee makers, Glasgow, exhibit a toffee wrapper driven by an electric motor. The machine wraps 4,000 toffees per hour, and the strong recommendation in its favour, from the point of view of the manufacturer and the consumer, is that it saves the sweetmeat from being handled in the process of wrapping. A chocolate melting pan, heated by electricity, is another appliance exhibited here.

The Western Electric Co., Ltd., have on their stand specimens of cables for lighting, power and telephony. There are also on view junction boxes and requisites for cable-laying works both aerial and underground.

Messrs. M. K. Cooper & Co., Glasgow, show models of electric cleaners of the "Regina" type; while Messrs. Falk, Stadelmann and Co., Ltd., London, exhibit principally a range of modern electroliers and period fittings suitable for all purposes.

The Jackson Electric Stove Co., Ltd., London, W., display a varied assortment of cooking apparatus comprising restaurant cooker, toasters, hot-plates, kettles, grills, latest types of domestic cookers, rapid water boilers and urns.

Automatic control gear is specialised in, as their exhibits plainly show, by the Electric Control Co., Ltd., Glasgow.

Quite an imposing show is made at Stand No. 42 by the Union Electric Co., Ltd. Switchgear and instruments of all types are to be viewed, while there is quite a large array of ammeters, voltmeters and frequency meters (Messrs. Hartmann & Braun). Arc lamps in operation and others not working can be seen.

Other exhibitors include the Concordia Electric Wire Co., Ltd., London; Magic Appliances, Ltd., London; the General Electric Co., Ltd., London; Messrs. Berry, Skinner & Co., London; J. Holly Craig, Glasgow; Fyfe, Wilson & Co., Glasgow; Messrs. Yates Bros., Darwen; Messrs. John Dugdill & Co., Failsworth; the Macfarlane Engineering Co., Ltd., Glasgow; and Messrs. Reavell & Co., Ipswich.

Messrs. R. Waygood & Co., Ltd., Falmouth Road, Great Dover Street, London, S.E., show a model of a Waygood automatic electric passenger lift.

The British Westinghouse Electric and Manufacturing Co., Ltd., have at their stand a big collection of appliances and plant. They show very prominently the Westinghouse "Auriga" drawn-wire lamp and the "Dim-a-lite" attachment for use in conjunction with electric lamps.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., have quite an ambitious display at Stand 49. Cables of all types and adapted to all purposes are shown, also numerous accessories. As was to be anticipated, however, much scope is given on the stand to the judicious advertising of the Henley wiring system.

It would be an unfortunate omission not to mention Stand No. 76, where Messrs. Edward & Sons, watch and clockmakers, of Glasgow, show quite a number of pulsynetic electric impulse clocks for use on board ship and in large buildings and institutions. A magnificent range of pulsynetic clocks is shown, while the exhibit also includes a set of electric chimes.

THE SHEFFIELD EXHIBITION.

On Friday last, October 24th, the Fuel, Light and Power Exhibition under the auspices of the Sheffield Branch Smoke Abatement League, was opened by the Lord Mayor of Sheffield (Ald. S. Osborn, J.P.).

The Exhibition buildings are conveniently situated in Townhead Street, near the centre of the city, and lend themselves admirably to the purpose. The object of the promoters is "To draw the attention of the industrial leaders and the public of Sheffield to the possibilities and improvements in the utilisation of fuel." In furtherance of the ideal both electricity and gas must of necessity play an important part, and Sheffield is fortunate in the possession of such admirably equipped and well organised undertakings for the production and distribution of both commodities, as the Corporation electric supply department under the management of Mr. S. E. Fedden, and the Sheffield United Gas Light Co., both supplying their respective products at a price comparing favourably with that charged in any other city or town in the kingdom.

It will be within the knowledge of many of our readers that gas is supplied in Sheffield to the ordinary householder at 1s. 3d. per thousand cb. ft., and for gas engines, it is to be obtained as low as 10d. per thousand cb. ft.

The prices for a supply of electricity are also low, and householders are now supplied at a fixed charge of 10 per cent. per annum upon the net assessment for ratable value plus ½d. per unit consumed, no rental being charged for meters. For power the ordinary price list varies from 1d. to ·6d. per unit, according to quantity consumed, whilst in conjunction with a good load factor a still lower price may be obtained by adopting the alternative rate of £4 per annum per K.V.A. of maximum demand plus ¼d. per unit consumed.

Quoting from the official catalogue, "there is a legend in Sheffield that the blacker the smoke which overhangs the city the deeper will the pockets of its citizens be lined with gold." To whatever extent this may have been true in the bad old days, it no longer holds good. There is less smoke and less fog every succeeding year, and it is not unreasonable to attribute the amended conditions to the enterprise which the leaders of industry in Sheffield have displayed in discontinuing effete and smoke and fog-producing methods in order to take advantage of the more cleanly, hygienic and economical means so opportunely placed at their disposal.

The realisation of a smokeless city may yet be far distant, but better methods of combustion applied to the hundreds of small steam plants in the city, or perhaps better still, the total supersession by electricity or gas, each applied to the work to which it is most suited, will bring the desired result nearer.

The Exhibition is divided in the main into three sections, electricity, gas, and fuel consumption. In the electrical section the electric supply department are making use of the opportunity to bring before existing and potential consumers the many advantages of electricity, and on a large and well-equipped stand are showing examples of almost recently designed apparatus for lighting, heating, cooking, ventilating and power. In conjunction with a local laundry, demonstrations of domestic ironing are given, and grilling, toasting, coffee-making, and all the necessities and luxuries of the home, office and works, which make life possible and pleasant, are in evidence.

The electrical contractors of the city are well to the fore, and Messrs. Marsh Bros., of Orchard Place; Messrs. Coates & Co., of Glossop Road; and Messrs. Denner & Co., of West Street, have each a comprehensive display of electric light fittings and other electrical apparatus principally intended for use in the home.

Messrs. John Walsh, Ltd., general furnishers, of High Street, have a very fine stand, one half of which is devoted to the display of electroliers and other lighting fittings, whilst the other half displays very similar fittings adapted for using gas. They have also equipped a model dining room in oak, lighted and heated by electricity.

Messrs. T. B. & W. Cockayne, Ltd., general furnishers, of Angel Street, have similarly a display of both electrical and gas lighting, heating and cooking apparatus, and have a further stall showing a completely furnished dining room, drawing room, bedroom and kitchen.

Messrs. Makin & Co., Ltd., of Townhead Street, are showing their recently introduced clock-type number sign for the smaller places of entertainment. This sign, on account of its low cost, is expected to supersede the more expensive type at present in use. They have also a display of electric clocks suitable for simultaneous time-keeping in works and other places.

Messrs. G. St. John Day (Patents), Ltd., are showing their improved type of "Mumps" lampholders, and also the ingenious "one-part" holder and accessories, and other secret and key-locking types to prevent the lamps and shades from being stolen.

Demonstrations of cooking by electricity and gas are being given alternatively by expert cookery instructors, the arrangements being in the hands of a Committee of local ladies.

The British Vacuum Cleaner Co., Ltd., are showing their various types of electrically-driven vacuum pumps and cleaners, and demonstrations are given throughout the day.

Messrs. Steinthall & Boydell have a comprehensive display of "Evershed" indicating, recording and testing instruments.

Messrs. Roper & Wreaks, of 112, Arundel Streeet, are the agents for Messrs. R. Hornsby & Son, Ltd., of Grantham, and they show in operation a 17-B.H.P. Hornsby-Stockport gas engine.

Messrs. T. W. Ward, Ltd., of Albion Works, Sheffield, are exhibiting examples of their lathes, drilling machines, slotting machines and shaping machines, all driven by Brooks's motors, one of which is also shown driving a generator, suitable for picture palace work.

The engineering section contains many interesting exhibits demonstrating the economies to be effected in the use of fuel for steam-raising.

Messrs. T. Sugden, Ltd., are showing at their stand complete models of their standard superheaters and accessories, and also a model boiler fitted with an "Excel" water circulator, for which a claim is made of increased steam and the saving of fuel.

Messrs. Meldrums, Ltd., exhibit their mechanical stoker and sprinkling stoker, their refuse destructors for municipal or private use, and various devices tending towards the production of steam without the accompanying nuisance of smoke.

Messrs. Whitehead Bros., Ltd., of Farsley, near Leeds, show a patent furnace for all purposes for which economy in fuel, prevention of smoke and increased capacity are not only claimed but guaranteed.

Messrs. Babcock & Wilcox, Ltd., have in motion a full-sized mechanical chain-grate stoker, and also exhibit models of their water-tube boiler with superheater and chain-grate stoker and of the water-tube marine boiler adapted for land service.

Messrs. E. Green & Sons, Ltd., show a model of their well-known patent fuel economiser.

Mr. J. W. Wilson, of Church Street, Sheffield, is showing various types of coal, gas and electric stoves, geysers and water-heaters and other household requisitions.

Messrs. T. A. Ashton, Ltd., show a selection of Messrs. Fletcher, Russell & Co.'s gas-heated furnaces for forging, melting, annealing, tempering and hardening, specially suitable for use in the Sheffield iron and steel trades. They also include in their exhibit various electrical appliances for domestic use, a petrol air-gas generator and the "Pyrene" fire extinguisher.

At the stand of the British Oxygen Co., Ltd., oxygen metal cutting and oxy-acetylene welding is in operation, in addition to hand and machine metal-cutting apparatus, and other oxygen appliances for medical and industrial use.

The exhibits are well arranged, with ample room for the public to move about and inspect the various stands. First class military bands are in attendance during the afternoon and evening, and good results are anticipated from the enterprise.

A NOVEL CONSTRUCTION IN ELECTRIC WINDING GEAR.

The application of electric power on a large scale to the operation of winding or hoisting in mines and collieries has recently received a great deal of careful attention and skilled design, but it would be a very rash thing to say that finality in design has yet been reached. It is, therefore, of interest to turn to any example involving novel elements of design, particularly if it has been shown that on a large and commercial scale its novel elements have contributed to success. For this reason it would be of value to refer to some large electric double-drum hoists recently installed by the Ray Consolidated Copper Co., at their mines at Ray, near Kelvin, in Arizona, These hoists, situated at their Nos. 1 and 2 main hoisting shafts, have attracted a great deal of attention, not only on account of the heavy loads handled and the large output required from these shafts, but also because of the many unique features of the hoists themselves. The hoist at No. 1 shaft has been in operation about 1½ years, while that at No. 2 shaft has been put into service during the past year. The electric power for operating these hoists, as well as the compressors and other machinery about the mines, is obtained from a generating plant at Hayden, about 19 miles from the mines, at which point a mammoth concentrating plant required by this company is situated. The power is generated by four cylinder triple-expansion condensing engines direct connected to alternating-current generators, and is transmitted to the mine at 40,000 volts pressure.

Each hoist handles loads of ore of 12½ tons, together with skips weighing 16,000 lb. from a maximum depth of 500 ft., hoisting at a speed of 300 ft. per minute. The total load, including the rope on each drum, is approximately 43,000 lb. These hoists, which are claimed to be the most massive of their kind in the United States and handling the heaviest loads, were furnished together with the sheaves, car tipples, &c., by the Wellman-Seaver-Morgan Co., of Cleveland, Ohio, U.S.A., and fig. 1 shows a general view of one of them. The hoists operate with balanced skips entirely, one of the drums being keyed fast to the main shaft, while the other drum is driven by a powerful band friction clutch for adjustment to different levels as required. Each hoist is equipped with an alternating-current motor, driven from a 440-volt, three-phase, 60-cycle supply; the motor has a full-load speed of 430 r.p.m., and is rated at 300 h.p. on a continuous rating. It is fitted with a rope wheel 44 in. in diameter, having turned grooves for 32 1-in. ropes, being connected to the hoist by a rope drive engaging a 13-ft. rope wheel on the pinion shaft of the main hoist, as shown in the illustration.

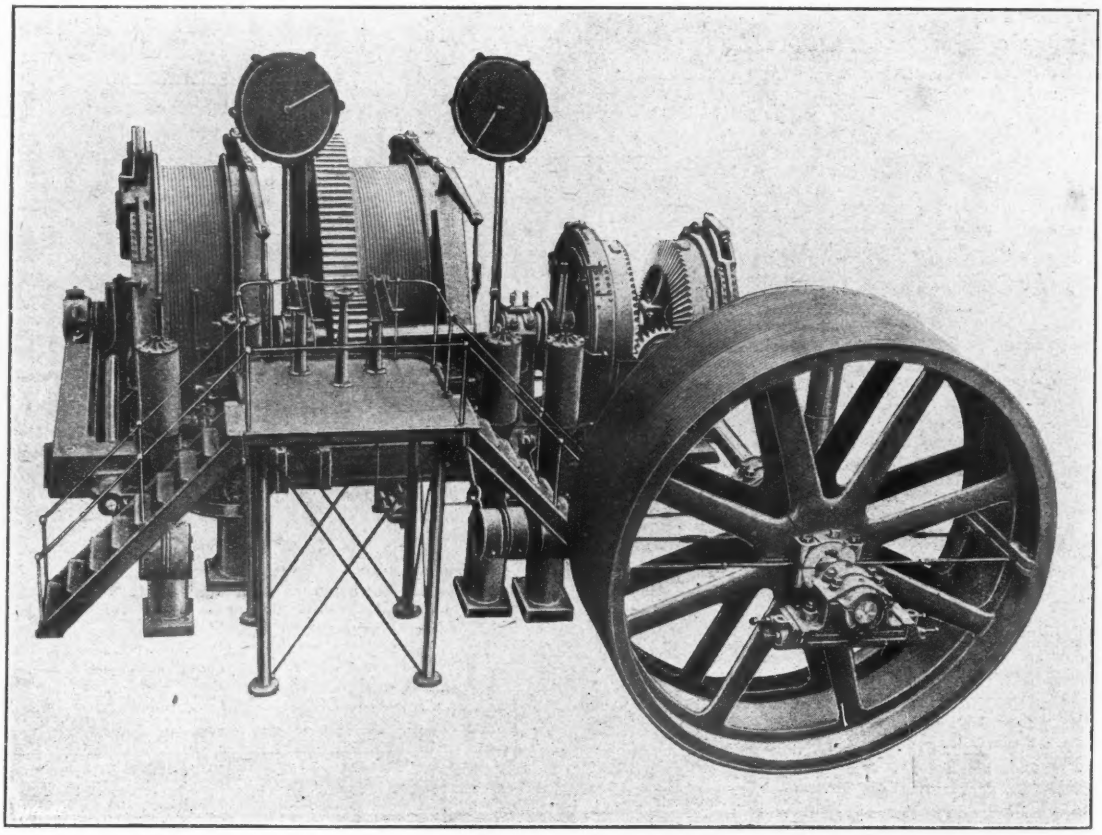


Fig. 1.—Large Electric Hoist at the Ray Consolidated Copper Co.'s Mine, Arizona.

The idea underlying the design of this hoist is that the motor for running a hoist shall operate continuously in one direction, while the drums may be started, stopped or reversed at will. The principal electric loss in hoists operated by alternating-current motors is occasioned by the starting of the motor which, when it is a large one, becomes very serious. It is very desirable, therefore, not to be obliged to start the motor at each trip, because when the motor is run idly the current required by it is very limited, so that the peak losses are very materially reduced. In this type of hoist the load is gradually accelerated by applying powerful friction clutches, the design of this clutch, shown in fig. 2, being in effect a band brake set in motion, which engages as gradually and easily as may be desired.

Each main hoisting shaft is equipped at the bottom with a large ore bin or pocket cut out of the solid rock over which a train of ore cars, each of 5 tons capacity, propelled by an electric locomotive, is run, and the cars are discharged

three at a time into the bin below by means of the rotary car tipple illustrated in fig. 3. These car tipples are rotated by means of the electric motor shown in the illustration. Each bin has at the bottom a measuring pocket which measures a skipful of ore into the skip as it comes to the bottom ready for loading. The gates of this measuring pocket are controlled by hydraulic cylinders operated by the man in charge. A similar ore bin is provided in the steel head frame in the top of the shaft into which the skips are automatically discharged. From these bins the ore is drawn into large gyratory crushers, which reduce it to about the size of 3-in. cubes for shipment to the concentrator. The ore pocket in the mine being nearly full of ore, the hoist motor is accelerated by lowering the empty skip, after which the hoist is started and operated in balance continuously until the bin at the top of the shaft is filled, when the hoist is discontinued for a short period of time. When the concentrator is running to its full capacity, each hoist handles a maximum of 5,000 tons of ore per day, in two shifts of eight hours each.

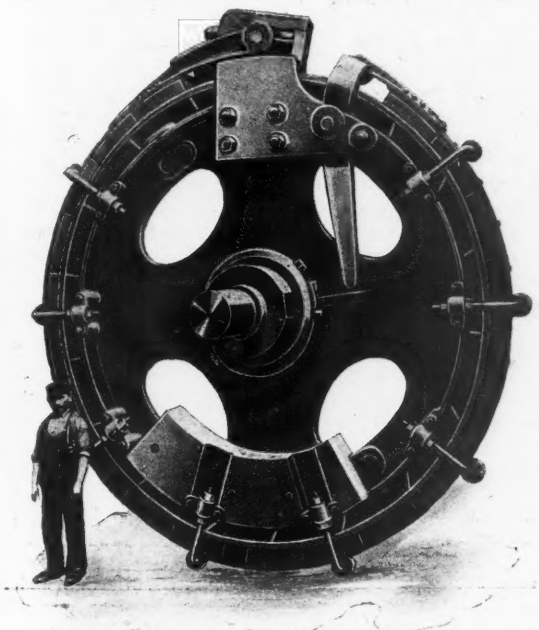


Fig. 2.—Friction Clutch for Electric Hoist.

The power is transmitted from the motor to the hoist by means of a bevel gear driving and reversing system, which is clearly shown in the general view. The pinion, which is of forged steel with machine-cut teeth, engages in two cast-steel machine bevel gears, which are completely enclosed in a steel casing and run in oil or grease. Both these gears are loose on the intermediate shaft, being fitted with bronze bushings of ample proportion, easily removable for renewal, while on the back of each of these gears is a friction ring with which the band friction clutch engages. These clutches, which are similar in design to the large one illustrated, are securely keyed to the intermediate shaft, and are operated by the vertical operating cylinders shown in the foreground, the clutches being applied by weights and released by the operating cylinders. The cylinders are controlled in their movement by a cataract cylinder filled with oil. The power used in the operating cylinder is compressed air taken from the air mains supplying the mine, but an auxiliary motor-driven air compressor is situated in the engine house, which automatically cuts in and provides air for operating the hoist should the mine pressure be shut off or go below a certain predetermined pressure. Both of the clutch operating cylinders are worked by a single lever on the operating platform, and are so connected that, although either clutch can be thrown in at will, both clutches can never be in at the same time, and one clutch must be wholly disengaged before the other can be engaged.

Each hoist is equipped with a safety device to prevent overwinding, which is operated by a hatchway limit switch placed in the hoisting shaft near the top. This device automatically throws out the clutches and applies a powerful post brake, stopping the skip within 6 or 8 ft. of its travel. It has been shown in actual practice that this safety mechanism entirely eliminates the possibility of an overwind. Both in its general features, therefore, and in the care which has been taken in working out the details of its design, it easily ranks as one of the most interesting examples of modern electric hoist practice to be found, and opens up a new phase of this subject.

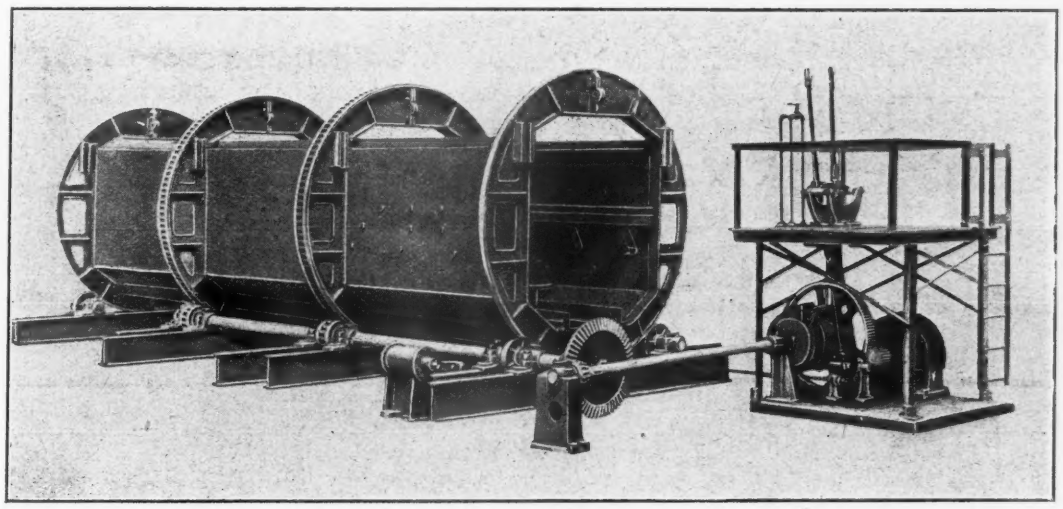


Fig. 3.—Electrically-Operated Car Tipple, at Shaft Bottom.

ELECTRICITY AT THE GHENT EXHIBITION.

(*Concluded from page* 368.)

Without doubt, to France must be given the credit of organising by far the most complete and interesting electrical section in the Exposition. The British electrical exhibits, though good, were very few in number and limited in scope, and the German firms, from whom so much might have been expected, were represented only by a few electric motors on textile machinery and machine tools; by quartz lamps outside the Congo Palace; by tungsten lamps (including some high-c.p. units built into houses of the arc-lamp type) in the Sporthalle; and by a selection of impregnated wooden poles. It is not too much to say that the dignity of the electrical industry was upheld only by the French exhibits in the Palais de France, by the radio-station in the Avenue des Nations, and by the exhibits, chiefly Belgian, in the Palais d'Electricité. The latter hardly justified its name, for though it was an independent building devoted exclusively to electrical exhibits, it occupied but a

small area and contained only a limited range of apparatus. We would suggest that where attendants are so numerous, there can surely be no harm in allowing visitors to walk on to the larger stands. Many of the latter at Ghent contained apparatus and wall diagrams, &c., which could not be inspected from the gangways, but visitors were not allowed to pass behind the boundary-chain unless M. l'Ingénieur were there, and, needless to say, in most cases and at most times he was *not* present. A further hardship inflicted on visitors whose time was limited, and to whom "les Attractions" did not appeal, was the closing of all the national palaces at 6 p.m. (latterly 5 p.m.). Some compensation was certainly to be found in the beauty of the illuminations in the grounds. In a number of the main avenues, tall arc lamp standards were provided with top reflectors, beneath which were arranged concentric rings of 14, 10 and 6 100-C.P. metal lamps; the results obtained put some of the neighbouring arcs to shame, but it is only fair to state that these arcs were by no means of the best types available. In the Park area of the grounds, very pleasing results were obtained by the use of festoons of metal lamps mounted in coloured balloons and artificial flowers, and strung among the trees.

In the French Section, the exhibits of the Soc. Gramme included series D.C. dynamos with commutating poles, and from 3 to 100 KW. output. These machines were characterised by the considerable length of their armature connecting strips, the great number of commutator bars and the exceptionally great distance from the armature to the end of the shaft at the commutator end of the machine; the axial length of the commutator clamping ring and of the shaft beyond it appeared unnecessarily great.

The Soc. Alsacienne de Constructions Mécaniques showed very handsome ranges of D.C. and A.C. motors of open and enclosed and traction and other types. Their wound-rotor induction motors were fitted with a substantial and efficient brush-lifting and short-circuiting gear, and their completely enclosed (double envelope) three-phase motor with forced ventilation attracted much attention. A high-frequency alternator built by this firm was used in the adjoining wireless station.

The exhibits by the Soc. Française pour la Fabrication des Tubes included telescopic and single-piece metal poles for all purposes. The sectional type designed for Colonial use was specially interesting; a hollow pole of square section was shown with bolted-on cross arms, a single cross arm being bent up at both ends to form pins for two glass insulators; each of the two pieces of a longer compound arm bent up at each end to carry in all four insulators; or a hollow square cross bar carrying one or two pins, each of which was extended below the cross arm and turned upwards to form a second pin below the first. The sectional poles of the Nou and Louvroil types appear to be admirably adapted to Colonial telegraphic and field wireless work.

Among the many excellent collections of insulated wires and cables of all types and carrying capacities, mention must be made of those shown by Messrs. Alliot & Rol, C. F. des Cables, C. G. d'Electricité and Devauge Cie. The ingenious "braid" conductors exhibited by the latter firm led us to wonder how soon an enterprising school for misses would include instruction in jointing with the needlework classes in its curriculum.

The uncanny echoes of the brush discharge proceeding from the E.H.T. enclosure equipped by Messrs. Vedovelli, Priestley & Co., proved strongly reminiscent of the "House of Whispers," and led to a number of amusing incidents. The person in charge of this exhibit, while admitting anyone who could produce a card inscribed with the magic word "Ingénieur," denied us this privilege, but for a consideration left us alone for ten minutes before his assistant arrived to close the doors in the lattice screens round the high-tension apparatus. Since the exhibition supply voltage was here raised successively from 220 volts to 6,600 volts and 110,000 volts, a little knowlege and the caution which it inculcated proved a useful thing; the safety of a lay visitor would have depended entirely upon his obedience to a printed notice, which to many would have been unintelligible. The E.H.T. transmission line in this enclosure was about 100 m. in length, and the power transmitted was 100 KW. At the receiving station the pressure was again reduced for lighting and power supply. The H.T. equipment included the necessary lattice towers, link insulators, leading-out wall disks of corrugated glass, and remote-control pressure oil switches capable of interrupting very heavy loads at 110,000 volts.

In the field of electrochemistry, the Soc. Anon. le Carbone, the Cie. Charbons-Henrion and the Cie. Française de Charbons showed extensive collections of carbons in all the forms required for electrical purposes. The Delafon exhibits included a very simple wall set (complete with miniature dry cells) for use in receiving time signals, &c. The complete Leclanché exhibit deserves mention.

The Soc. des Accumulateurs Heinz arranged an excellent exhibit of their accumulators, primary cells and aluminium rectifiers. The Lumière primary cells are built in capacities up to 1,000 ampere-hours (at 12 amperes discharge), and the Heinz accumulators range in size from the smallest ignition cells to the largest central-station and submarine types. In some of the central-station cells, the plates are cast into leaden bus-bars; in other cases, bolted lugs are employed. The submarine cells are encased in brass-bound, heavy wooden boxes. We were impressed by the design and liberal rating of the aluminium rectifiers shown by this firm; the largest standard equipments provide 100 amperes D.C. at 105 volts for 10 hours per diem, and have been applied successfully to the excitation of alternators, charging of accumulators, operation of small motors, projector arc supply and so on.

In the central-station accumulators (1,000-1,500 ampere-hour capacity) exhibited by the Soc. Travail Electr. des Métaux, all the plates of similar polarity in each cell are bolted to through-running brass bars by two brass nuts apiece, and copper links are used between cells. This and equivalent arrangements employed by other manufacturers are very convenient in cells intended for export, but are, we believe, inherently inferior to burned or cast connections. In some traction cells, this firm uses a through brass bus-rod with end nuts, carrying leaden reels between the plate lugs. A boiler tube-cleaner motor also exhibited comprised a D.C. armature and commutator about 1 ft. in length and 4 in. in diameter, mounted in a brass tube between two plate pole pieces, excited by coils coaxial with and at either end of the armature.

The Etab. Keller Leleux exhibited a fine collection of crystalline fractures of electric furnace products, and a model and drawings of the Keller furnace. This exhibit should apparently have been included in the electrometallurgy class, in which were to be found a number of exhibits of electrometallurgical products, including iron alloys, ferrochromes, ferrosicilons, carbide, &c., and electrolytic products, including electrolytic copper, nickel and brass in all forms, and pure metals recovered electrolytically from their ores without roasting or smelting. In the same section were models of Girod and Heroult furnaces; 43 furnaces of the latter type now in use total 198,200 kg. capacity, and 15 which are under construction will have a total capacity of 97,000 kg. An excellent joint exhibit of "French aluminium" included aluminium utensils of all kinds, aluminium castings and stranded aluminium cables. The Soc. des Carbures Métalliques showed a magnificent collection of carbon ingot moulds and heavy electrodes, for electric furnace use, complete with screw plug connectors. The largest electrode shown measured 2,000 × 500 × 500 mm., and weighed 820 kg. (16 cwt.).

In the electric lighting group, the Cie. Gle. de Travaux d'Eclairage presented a collection of photographs of lighting fittings and their glassware; Weissman's *perles* proved to be very striking glass bead shades, festoons and "drops." Over 50,700 metal lamps were installed by this company in the decoration of palaces and avenues in the Exposition. Messrs. Kemmell, Piel et Cie. showed very artistic strip lighting cables and shades, and Cance, Fils et Cie. exhibited an exceptionally well-built type of flexible cable, with lampholders complete; the mounting of the latter appeared to be good both mechanically and electrically. The well-known Bardon arc lamps were well represented; a feature of the distribution board by this firm was the protection of the fuses by tubes of lightly-glazed porcelain, supported only by the fuses on which they were threaded. La Maison Grivolas mounted examples of insulators and remote-control outdoor

H.T. switchgear on a lattice tower and surrounded the latter with Bastian quartz heaters, aluminium castings, switches of all kinds and wooden insulators, &c. The Soc. Française d'Incandescence par le Gaz shows signs of the times in the shape of O.R. metal lamps, in which a filament is hung in loops at right angles to the central stem on radial wires projecting from the latter. The central stem is of white refractory clay, and is supported at its outer end by a glass pin fused in the tip of the lamp, a special feature of which is its high candle-power through the bottom or tip end. "Le Compose Tout Universelle" (Ruthardt et Cie.) is an electric transparency sign, each aperture in which is served by a long strip carried between two rollers and containing all the letters of any desired alphabet, numerals, &c. The message of the sign can thus be changed at will; the apparatus appears to be quite serviceable, and is made in various useful forms.

The Admin. Française des Postes et des Télégraphes showed various types of the Baudot apparatus in operation, including the 1909 double apparatus with special discharge arrangements for use on submarine cables of medium length, and the *quadruple échelonée* system connecting three stations A B C, and giving two *secteurs* between A B, two between B C, and two between A C with automatic retransmission at B. This exhibit included a section of a semi-automatic exchange switchboard as now in use at Marseilles and d'Angers.

Messrs. Ducretet et Roger's fine exhibit in this section included much wireless apparatus. A double arc apparatus was shown for use in radio-telephony over distances up to 30 km. overland, and a group of four microphones piped in parallel to a single mouthpiece, and capable of being connected in parallel or series, was also exhibited for this work. A relay moving-coil galvanometer giving good relay contact when actuated by 0·67 microamp., and hence suitable for use in stationary radio-stations, and a Pollak telephonic relay for use in public halls, were among the exhibits which justly claimed attention on the stand.

Dr. Glover's "physiological" (nose and mouth) double-microphone instrument for long-distance telephony was exhibited, and is claimed to be very effective. However this may be, the instrument certainly aggravates the hygienic problem, and we should have expected a doctor to have taken this into account in developing an improved design. The Ancel exhibits included a radio-receiving set on marble wall slab for "municipal or administrative use" (the latter exhibit looked the part). In the Ancel three-style drum recorder, one style is actuated by, say, the Eiffel Tower signals, one is connected to the clock controlled, and one to an electric tuning fork (beating $\frac{1}{100}$th sec.). The wall board exhibited for use with this recorder and with ear pieces is probably the most elaborate of the many equipments which have been introduced in this connection during the past few years.

The Cie. Gle. Radiotélégraphique exhibited standard 1·5-KW. and 2·5-KW. sets for use in yachts and larger vessels, and other radio-apparatus.

The Ste. Française Radio-Electrique exhibited its transmitting and receiving apparatus for radio-telegraphy and telephony in an annexe behind which was erected a 75-m. pylon of light lattice construction (by Schmid, Bruneton and Morin). The musical spark system was employed in conjunction with the S.F.R. resonance alternator, for which very high efficiency is claimed. The "musical" spark made life more or less unbearable in the adjacent hall, but its note was undoubtedly very pure. Among other apparatus this firm exhibited some excellent ship sets and a small set, designed for fishing-vessels, which was very neat but which, we should say, was too delicate and complex for use by the average skipper or mate. The mule-pack radio equipment designed for military purposes appeared to be exceptionally useful. Special sets designed for amateur, naval and aerial use were also exhibited; the aeroplane equipment weighing 35 kg. is claimed to have an effective range of 150 km.

The wireless station in the Ave. des Nations worked in conjunction with an aerial suspended from a 100-m. square lattice mast weighing 10 tons; the handsome appearance of this mast was largely due to a lattice wood sheathing, on which platforms were built at intervals. The transmitting apparatus was erected in a bungalow of "colonial" construction (fireproof fibre compo wall slabs and roofing on steel lattice and netting). An oil-driven alternator in an adjacent bungalow provided the necessary power. During the Exposition this station was in more or less regular operation in public wireless service. The Soc. Ind. de T.S.F. showed an interesting collection of transmitting and receiving apparatus designed for use on aeroplanes, automobiles, &c., and characterised by their high sensitivity and light weight. An interesting type of telescopic mast capable of pneumatic elevation to a height of 50 ft. or so, by aid of a foot pump, was exhibited.

The Soc. Belin's exhibits included an automatic time signal emitter (similar to that in use at Paris), and examples of the ingenious and beautifully-made Berlin telephotographic apparatus with portable transmitter, permitting a telephone message and picture to be sent simultaneously from an ordinary telephone station. About 25 sq. in. of picture can be transmitted in 4 minutes over a 1,100-km. line; examples of telephotographic reproductions were shown. An extremely interesting collection by the Soc. Ind. des Téléphones included a Routin regulator, an electrostatic balance for telegraphy over H.T. lines on the Gacogne system, very fine heavy switchgear for accumulator control, as well as an 8,000-ampere single-pole automatic circuit breaker, and an isolating switch of the same capacity with contact clamping bolts.

Messrs. Hamm exhibited, in addition to telephonic and signalling apparatus, a particularly neat poulie-pompe (a centrifugal pump, the housing of which is bolted directly on to the motor frame, and the runner of which is carried on the extended motor shaft). This pump is suitable for many domestic and industrial purposes, and is built in standard sizes up to a capacity of 10,000 litres per hour through 10 m. lift, or 5,000 litres per hour through 30 m. lift. The charging board exhibited by this firm was of very good but rather extravagant design, which brings us to a noticeable characteristic of many French switchboards for small installations, viz., beautiful design and construction, but lavish expenditure of space and material, and a lack of general robustness and "strength where it is wanted."

To a commissaire de police de Paris must be given credit for a miniature electric projector suitable for attachment to any revolver, and showing a black spot (at ranges up to 65 ft.) at the point where the bullet will arrive.

Some remarkably fine exhibits were to be found in the instrument section. So well known are Carpentier instruments that it is hardly necessary to do more than mention them: those shown included double instruments indicating KW. and K.V.A. individually and p.f. at the intersection of the pointers, and a Ferrié wave meter of similar design. Da & Dutihl exhibited an excellent series of instruments. Messrs. Darras showed a perforator for high-speed telegraphy, and a neat box apparatus for receiving time signals and suitable for travelling purposes. The Beaudouin lamp is surely the *modèle de luxe* of small projector arcs (though whether it is a commercial proposition is another question) and the precision high-sensitivity electrometer by the same maker offers many advantages, including complete visibility of working parts at all times. The Collot, Longue exhibit included many interesting pieces of apparatus, among which may be mentioned the Abraham *rhéographe* and the Abraham and Villard electrostatic voltmeter (5,000-15,000 volts). M. Pellin showed very fine optical instruments, and to conclude an all-too-brief review of this section, Thurneyssen exhibited some X-ray tubes and radio-active apparatus, and Prin a synchronised printing chronograph recording minutes, seconds and hundredths of a second.

Palais d'Electricité.—A special feature of this hall was its electrical illumination, which was produced by a comparatively small number of frosted lamps, hung in festoons from the roof girders, and by loops of Weissman "perles" in the angles of the stall portieres, as well as by an electrically illuminated fountain.

The Soc. des Ateliers de Constr. Electriques (Charleroi) exhibited a collection of apparatus, including a powerful motor-driven point-shifting gear for railway use; a high-tension three-phase oil switch with maximum cut-out and time limit; motors of all types; a neat design of three-phase rotor rheostat (with three concentric arcs of seven contacts in the 7-H.P. size); and a neat ironclad knife

switch and fuse with pilot lamp, withdrawing switches and fuses complete and leaving the box dead.

The Soc. Anon. de Téléphonie Privée had a good show of telephone sets of good design, and the Admin. des Télégraphes de l'Etat Belge showed a retrospective collection of Morse apparatus provided with Van Rysselberghe anti-inducteur apparatus for simultaneous telephony and telegraphy. An interesting stand, devoted to the subject of wireless telegraphy in the Congo, was equipped with a certain amount of apparatus historical in this connection, and with literature and photographs describing and illustrating the work already done. The Belgian Congo has already in service a well-distributed network of 14 stations, and it is hoped that within 18 months direct wireless communication will be established between Brussels (Laeken) and Boma (6,300 km., including 600 km. oversea and 2,500 km. over African sands), eliminating all dependence on cable companies. *L'Expansion Belge* denounces as a *canard* the rumour that such communication has already been effected. The Union des Exploitations Electrique en Belge provided an excellent collection of domestic electrical apparatus, supplemented by striking posters and a well-designed meter-board for demonstration purposes.

The Tudor Co. supplied a large collection of their well-known cells of all types and sizes; Vanderstuyft, a 1,500-ampere, 10-volt electrolytic dynamo with double commutator; and Boens lightning conductors arranged to receive time signals. The Atel. Jaspar illustrated well the electric driving of lifts and machine tools, and showed a contactor-type switchboard. The Bell & Antwerp Telephone Co.'s interesting exhibit included private exchange boards and a complete range of telephone instruments and accessories, including collector microphones for use in public halls, &c. There were also exhibited the well-known Marconi field and ship stations. Finally, in concluding remarks which barely outline the wealth of electrical material exhibited by France and Belgium, to which less than justice was done by the method of its arrangement, attention may be drawn to L'Industrielle d'Accumulateurs' large exhibit of cells, most noticeable among which was the export type in which each plate was attached by a leaden bolt and nut to a leaden bus-strip, thus facilitating the packing of the component parts for transport.

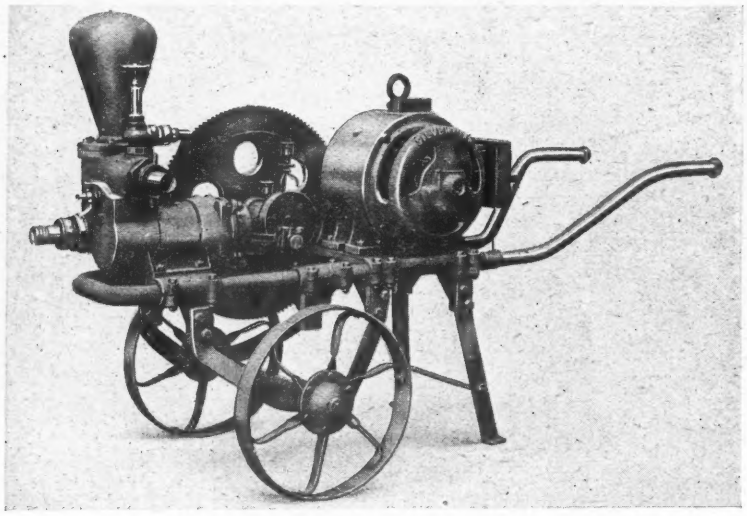


Fig. 1.—A Portable Electrical Pump.

British Association, 1914.—The British Association for the Advancement of Science has now issued its programme of arrangements for the Australian visit, also for the meeting which opens at Havre on August 4th, by invitation of l'Association Française pour l'Avancement des Sciences. Readers who are interested in either of these meetings will be able to obtain full information by writing to the Secretary at Burlington House, London, W.C.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Handy Movable Crow-Bar.

An extremely ingenious crow-bar has been devised and patented by Mr. Robert H. Lasch, of 33, Bolsover Street, London. As shown in the accompanying fig. 2, it is provided with broad runners, which enable it to be used not only for lifting, but also for transporting heavy goods, without necessitating the use of trucks or rollers. Owing to the shape of the shoe, it is not liable to shift or slip when pushing or pulling a load, and the rollers provide a fulcrum which is always ready and cannot capsize; moreover, the effect of the rollers is to cause a tendency to glide towards the load. By its use time and labour are saved, and breakages avoided.

Portable Electrically-Driven Wine Pump.

The I.E., G.P. and Telegraph Works Co., Ltd., of Silvertown, have recently designed a pump specially for dealing with grape juice containing husks and pulp. The pump body and plunger are of gun-metal, with copper air vessel, a relief valve being fitted with a by-pass to prevent damage to the pump in case of a stoppage in the delivery pipe.

Fig. 2.—"The Handy" Movable Crow-Bar.

The pump (fig. 1) is fitted with hose unions on suction and delivery, and has a capacity of 12,000 litres per hour against a head of 35 ft. The motor is a "Silvertown" F.E. 2 type, capable of developing 2 B.H.P. when running at 1,000 R.P.M., and drives the pump through machine-cut spur gear.

The total weight of the set, complete with motor starter, is 5¾ cwt., and being carefully balanced on the trolley it is easily transportable by one man, while, at the same time, it is perfectly stable in use. The set is, of course, suitable for pumping liquids other than grape juice and the motor can be supplied suitable for any standard voltage, and either direct or alternating current.

In addition to the above, the pump can be supplied, driven by a petrol or paraffin engine, and is thus serviceable in places where electricity is not available.

The "Wireless" Cable Tester.

Messrs. Edwin A. Mansfield & Co., of 12, Beckenham Road, New Brighton, are introducing an inductively operating testing set for locating faults in cables and wiring.

Briefly, it consists of a sending apparatus—a small cabinet which will contain sufficient battery power for ordinary work, and is provided with a clockwork interrupter in the line circuit—this is coupled up to the circuit which it is desired to test. A portable detector coil coupled up to a telephone receiver is provided for exploring the route of the supposed faulty cable, the fault being, of course, usually detected by the cessation of the hum in the receiver.

The induction method of testing by means of alternating or interrupted currents is probably well known to our readers; the Mansfield apparatus is the result of some years' experience, having met with considerable favour in the States, where the Western Electric Co. alone has 68 of these testers in use.

Two battery circuits are provided in the B type tester, permitting the use of 4 to 6 or 10 to 15 cells for average testing and high-resistance testing—the latter useful in the case of a shorted twisted pair

The apparatus is also adapted for finding lost pipes, and many gas and water companies, both in America and this country, have adopted it.

An Illuminated Thermometer.

An illuminated thermometer, known as the "Karmos," has been introduced by the Karmos Electrical Co., of 30, Gordon Street, Glasgow, which consists of an ordinary thermometer mounted on a window in the base, which latter contains a small dry cell and glow lamp with a button switch, for giving the necessary light. The device is suitable for use in normally dark or dimly lighted situations, such as cellars, ships' holds, &c.

An Ediswan Heater.

We illustrate in fig. 3 a new Ediswan heater for this season's trade, by the Edison and Swan U.E.L. Co., of Ponder's End. It is

Fig. 3.—New Ediswan Heater.

finished in oxidised silver, and fitted with two switches, 12 glowers, and 2 yards of flexible wire. The consumption is 1 and 1½ units per hour, according to the degree of heat desired.

'Tricity Cooking at a Bazaar.

The whole of the cooking for the Children's Hospital Bazaar, held recently at Derby, was arranged by Mr. T. P. Wilmshurst, the borough electrical engineer, to be done electrically by means of Tricity cookers. Some 280 dinners were cooked and served during the four days the bazaar lasted, with a total consumption of 291 units, which, at the rate of 1d. per unit, at which current is supplied for cooking purposes, works out at approximately 1 unit, or 1d., per dinner served.

The demonstration aroused considerable interest, and a special feature was that all the cooking was done in close proximity to the visitors who dined, which would have been impossible with any other method of cooking, owing to the heat and smell.

The following apparatus was used:—Three duplex cookers, five extension cookers, one double and one single oven, and a selection of utensils for heating, boiling, &c.

It is interesting to learn that the lady controlling the refreshment stall expressed the opinion that the cooking would not have been such a success if it had not been for the electric apparatus, and that everyone who saw the cooking expressed satisfaction therein; it is also gratifying to know that the stall cleared £130 after all expenses had been paid, almost entirely from meals.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"Practice" writes: "I should be glad to have your legal contributor's opinion with regard to the liability of a supply company in the following cases:—

"(1) If a line having no lightning arresters be struck by lightning and a motor connected to it is damaged.

"(2) The failure of one main of the supply causing damage to motors connected; the failure of the main might be a simple break or an earth fault; it being understood that the liability mentioned above refers to the breakdown of the motor or its controller.

"I should also like to know whether a failure of one leg of a three-phase supply comes under Clause B, Board of Trade Regulations (Electric Lighting Acts, 1882 and 1888)."

*** As to (1), Clause 11 of the Board of Trade Regulations for securing the safety of the public provides that: "Where any portion of any electric line or any support for an electric line is exposed in such a position as to be liable to cause injury from lightning, it shall be efficiently protected against such liability." Clause 35 of the same regulations provides that: "If the undertakers make default in complying with any of the preceding regulations, they shall on conviction be liable to a penalty not exceeding £10 for every such default, and to a daily penalty not exceeding £10. The recovery of a penalty under these regulations shall not affect the liability of the undertakers to make compensation in respect of any damage or injury which may be caused by reason of the default." The regulations made under the Act of 1888 further provide that: "Any electric line or any support therefor exposed to liability to injury from lightning shall be efficiently protected against such liability."

As to the first question, it therefore seems as if the liability of the undertakers is clear if they fail to take precautions to prevent damage by lightning. As to the second question put by "Practice," the liability of undertakers is expressly reserved by Sec. 77 of the Electric Lighting (Clauses) Act, 1899, which provides that the undertakers shall be answerable for all accidents, damages and injuries happening through the act or default of the undertakers, or of any person in their employment, by reason of, or in consequence of, any of the undertakers' works, and shall save harmless all authorities, bodies and persons by whom any street is repairable, and all other authorities, companies and bodies collectively and individually, and their officers and servants, from all damages and costs in respect of those accidents, damages and injuries. This does not mean, of course, that undertakers are liable, even in absence of negligence. To fix them with liability for a defective main it would have to be shown that they had neglected to inspect or repair and renew a cable, or had omitted to take obvious precautions to prevent accidents of the kind described.

Fig. 4.—'Tricity Cooking Apparatus at a Bazaar.

"Electric Supply" writes: "We have been approached by the owners of a large estate to supply electricity to such estate. The estate is situate in three parishes, one parish being supplied by this company and in its area, the other two by another company. I shall be glad if you will kindly inform me whether it is possible for my company to give a bulk supply with mains, &c., in its own area, such supply to be taken all over the estate, parts of which are outside our area. The owners of the estate propose laying all the cables on the estate. It is not the intention of the owners of the estate to charge per meter, but to charge per KW. demanded per annum."

*** Prior to the Electric Lighting Act, 1909, it would have been impossible for "Electric Supply" to acquire any right to supply outside his own area. That Act, however, confers wide powers upon the Board of Trade to permit of external supply. By Sec. 6, "where it is proved to the satisfaction of the Board of Trade that the occupier of any premises is desirous of obtaining a supply of electricity from any undertakers within whose area of supply those premises are not situate, the Board of Trade may, if the local authority within whose district the premises are situate, and the undertakers, if any, authorised to supply electricity to such premises consent, by order permit the first-mentioned undertakers to give a supply to those premises on such terms and subject to such conditions as the Board think fit. Provided that, if in the opinion of the Board any consent required by this sub-Section is unreasonably withheld, the Board of Trade may proceed as if such consent had been given." This section goes on to specify the conditions in which the Board will exercise this power. It will be seen that the request must come from a consumer. Whether the Board has power to move at the request of the undertakers is somewhat doubtful. Mr. Knowles in his "Law Relating to Electricity," states that "The powers under this section could be very conveniently requisitioned by the occupiers of premises in the neighbourhood of the mains connecting the area of supply with a generating station outside that area." Whether the Board will make liberal use of their powers in this respect is doubtful, in view of the opinion of the Joint Committee of 1898, that, when a local authority or company, having power to supply current within a certain area of supply, seeks to obtain land compulsorily for a generating station outside that area, "it should not be allowed, except when Parliament or the Board of Trade decide otherwise, to supply from that generating station any area outside the area of supply of such authority or company."

With the co-operation of those undertakers who supply in the other areas, it is possible that something might be done by agreement; but it does not seem very hopeful.

NEW PATENTS APPLIED FOR, 1913.

(NOT YET PUBLISHED.)

ompiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

23,035. "Replacement fuses and/or switches for electric circuits." G. O. Donovan. October 13th. (Complete.)

23,046. "Antiseptic guard for mouthpieces of telephones and the like, and the fixing appliances." F. Lewis. October 13th.

23,057. "Electrical hot plates." J. Esson. October 13th.

23,110. "Electrical switches." L. Hulbert. October 13th. (Complete.)

23,113. "Receivers adapted for wireless telegraphy." H. Abraham. (Convention date, October 18th, 1912, France.) October 18th. (Complete.)

23,127. "Electric motor starters." H. J. Norsalle and J. L. Lawson. October 13th.

23,137. "Automatic telegraph transmitters." E. Thompson. October 13th.

23,188. "Electric arc lamps." Siemens-Shuckertwerke G.m.b.H. (Convention date, February 4th, 1913, Germany.) October 14th. (Complete.)

23,202. "Electric pocket lamps." W. Kaltwasser. October 14th.

23,218. "Electrical cooking apparatus." R. S. Dowse, W. Travis and Brompton and Kensington Accessories Co., Ltd. October 14th.

23,247. "Electrical switches or circuit-breakers." F. B. Holt and E. O. Moller. October 14th.

23,277. "Magnetic motor." E. W. Fuller. October 15th.

23,281. "Air filters for electric generators." Heenan & Froude, Ltd., and W. Wheal. October 15th.

23,332. "Electric relay." W. R. Sykes Interlocking Signal Co., Ltd., and R. W. Tarrant. October 15th.

23,336. "Automatic selecting devices for telephone systems." Siemens and Halske Akt. Ges. (Convention date, October 17th, 1912, Germany.) October 15th. (Complete.)

23,340. "Means for operating gas valves from a distance." Marconi's Wireless Telegraph Co., Ltd., and C. P. Ryan. October 15th.

23,342. "Terminals for high tension electric apparatus." F. Coates and A. Reyrolle & Co., Ltd. October 15th.

23,386. "Electric hair wavers or curling appliances." C. M. Holmquist. October 16th.

23,388. "Vibration damper for use with incandescent, electric, or gas light, arc lamps, or any illuminant of a fragile nature, the efficiency and life of which would be increased by isolation from external vibration." W. P. Taylor and J. Willis. October 16th. (Complete.)

23,444. "Electric switches." J. H. Tucker and J. A. Crabtree. October 16th.

23,449. "Electric protective systems." E. G. Waters. October 16th.

23,452. "Shade supporting devices." E. C. R. Marks. (Benjamin Electric Manufacturing Co., United States.) October 16th. (Complete.)

23,457. "Casing and capping for use in connection with electric wiring." B. S. Anderson. October 16th.

23,478. "Electrical signalling apparatus." G. Dearle. October 16th.

23,486. "Fittings for electrical conduits." Barton & Sons, Ltd., A. Barton and R. E. Barton. October 17th.

23,487. "Fittings for electrical conduits." Barton & Sons, Ltd., and A. J. Harper. October 17th.

23,492. "Electrical cut-outs or fuses." L. A. Waller and E. D. Rodway. October 17th.

23,517. "Apparatus for controlling electric current." A. Schnorr. October 17th.

23,525. "Electrical cooking apparatus." R. S. Downe. October 17th.

23,527. "Electric water-heaters and the like." R. Weaving and Ferranti, Ltd. October 17th.

23,535. "Instruments or apparatus for registering telephone calls." J. S. Foley, W. Hill and H. Hackett. October 17th.

23,543. "Electric motor and other lamps." J. Collins and Optalyte, Ltd. October 17th.

23,553. "Apparatus for exhibiting pictures, advertisements, and the like." W. J. Mellersh-Jackson. (Elektro-Reklame G.m.b.H., Germany.) (Addition to 5,029/13.) October 17th. (Complete.)

23,557. "High-frequency alternators." Marconi's Wireless Telegraph Co., Ltd., and C. S. Franklin. October 17th.

23,565. "Telephone exchange systems." Western Electric Co., Ltd. (F. T. Woodward, Belgium.) October 17th.

23,570. "Synchronised electrically-controlled clocks." C. E. O'Keenan. (Convention date, October 25th, 1912, France.) October 17th. (Complete.)

23,587. "Single-lever combination of electric switches." A. G. Farmer. October 18th.

23,601. "Caps or mouthpieces for telephonic transmitters and other sound instruments." A. Marr. October 18th.

23,640. "Electric signalling systems for railways and the like." T. D. Parr. October 18th.

23,649. "Electric incandescent lamps." C. P. Elieson. October 18th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1912.

Means for Automatically Equalising the Load on Electric Tramways or Railways. B. J. G. Bergman. 14,846. June 25th.

Dynamos for Lighting Vehicles. S. L. Price. 19,845. August 23rd. (February 24th, 1913.)

Musical Instruments with Electrically-Operated Vibratory Sounders. M. L. Severy and G. B. Sinclair. 19,868. August 30th.

Manufacture of Solid Bodies from Metallic Powders. H. Leiser. 22,041. September 27th. (October 2nd, 1911.)

Electric Switches. H. H. Berry and W. J. Markham. 22,118. September 28th.

Means for Electrical Alarm Signalling in Connection with Steam Engines and Machinery. T. H. Hill. 22,412. October 2nd. (Cognate application, 29,882 of 1912.)

Means for Controlling Electrically-Operated Mechanisms and the Like. H. H. R. Green. 22,646. October 4th.

Safety Electric Lamps, more especially intended for use in Mines. W. H. Hanson, H. L. Langston and Electrical Power Storage Co. 22,738. October 5th.

Electric Supply Systems. P. Young. 22,852. October 7th.

Brush Holders for Dynamo-Electric Machines. J. H. Holmes. 22,985. October 8th.

Driving Gear for the Armature Shafts of Magneto-Electric Igniting Apparatus for Internal Combustion Engines. S. K. Thoresen and O. R. Olsen. 24,691. October 28th.

Transmission of Photographs and other Pictures by Means of Ordinary Telegraph and Telephone Apparatus. U. Ellero. 24,768. October 29th.

Indicating Apparatus for Indicating the Speed of a Vessel irrespective of a Tide or of a Current. A. G. Noble. 25,487. November 6th.

Electric Motors. G. E. Thomas. 26,366. November 18th.

Method of, and Means for, Holding Tubes, Rods, Bars and other Articles in Position to be Electroplated. G. P. M. Lee and W. A. Brame. 26,765. November 21st.

Regulation of Electric Installations and Systems. Akt.-Ges. Brown, Boveri & Cie. 27,069. November 25th. (February 3rd, 1912.)

Dynamo-Electric Brakes for Electric Motors. Etchells, Congdon & Muir, Ltd., and F. Muir. 27,482. November 29th.

Electrolytes for Galvanic Batteries. W. H. Lowe. 27,634. November 30th.

1913.

Apparatus for Controlling Synchronous Motion Electrically from a Distance. Siemens-Schuckertwerke Ges. 687. January 9th. (August 2nd, 1912.)

Electrical Terminals. J. W. Record. 763. January 10th.

Galvanic Cells having Gelatinous Electrolytes. J. A. E. Achenbach. 832. January 10th.

Magneto Apparatus for Use especially in Connection with Internal-combustion Engines. "Mafam" Motor Apparate Ges. 1,093. January 14th. (February 3rd, 1912.)

Selective Signalling System. R. N. Hill. 2,612. January 31st. (March 21st, 1912.)

Means for Interlocking Electric Switchgear with Lids of Boxes. H. Hirst and J. Strachan. 2,686. February 1st.

Miners' Lamps. T. Heaton. 4,707. February 24th.

Electrically Heated Igniters for Internal Combustion Engines. H. Royer. 7,302. March 27th. (March 30th, 1912).

Supervisory Circuits for Telephone Systems. Siemens & Halske Akt. Ges. 7,531. March 31st. (March 30th, 1912. Patent of Addition not granted.)

Regulation of Electric Motors. Allgemeine Elektricitäts Ges. 7,896. April 3rd. (April 3rd, 1912.)

Receiving Arrangement for use in Wireless Telegraphy and Telephony. W. P. Thompson. (Ges. fur Drahtlose Telegraphie.) 8,821. April 15th.

Electrical Relay Arrangements. A. N. Hovland. 10,472. May 3rd. (May 6th, 1912).

Timing Devices for Operating Electric Switches and other Apparatus. S. Chiger. 10,559. May 5th.

Apparatus for Winding Electrical Machines. Maschinenfabrik Oerlikon. 14,633. June 24th. (June 24th, 1912.)

Reels for Laying Field Telephones and the Like. J. Baudisch. 17,563. July 31st. (October 9th, 1912.)

Trade Union Assistants and Evening Classes.—There appears to be no limit to the action which Trade Unions will take to "protect the interests of their members," and the inconvenience and bad feeling created by strikes and disputes have now found their way into the technical instruction class-rooms. At Bradford, where technical classes in nearly every trade are in existence, the student apprentices of one trade have been called out by their Union because of the attendance of clerks who are employed at the places where the apprentices work. It appears that previously the students attending this particular class were all Trade Unionists, but latterly the education authorities have considered that it was in the interests of sons of employers, clerks and others, that they should have an opportunity of obtaining a technical knowledge of the trade with which they were connected, in order to fit them for their future positions. Four costing clerks were admitted to this particular class this session, and, upon this being brought to the notice of the Union concerned, and the subsequent refusal of their request that these youths should be suspended from the classes, they have called out the two instructors—both Trade Unionists—and the other students to the number of about 30. This action has been described as despotic, and tyrannical it certainly is, as it precludes persons who desire to learn a trade from doing so, among them the sons of employers, who could hardly become members of the Union. There has been some suggestion that Union apprentices in other classes should take similar action, and, if this is done, the whole of the classes will be dislocated.

Flour-Mill Driving.—In a paper by Mr. R. B. Creak on "Modern Flour-Mill Machinery," read before the Institution of Mechanical Engineers on Friday last, the author stated that the continuous load was an excellent one for economical steam driving. Electric driving was making some headway, but it could be demonstrated that energy must be supplied at something like 0·4d. per B.T.U. before electric power could compete in price with steam. There was no field for individual driving, as the machines must start and stop and run together as a complete plant. The usual plan where electric driving was adopted was to put down a motor for driving the wheat-preparing plant, one for driving the roller-shafts on the bottom floor, and one for driving the upstairs line-shafting. There were about a dozen flour-mills driven by electric power at present in this country, and these reported very favourably on the system. Greater regularity of speed was one of the claims made for electric driving. This was a matter of very great importance where so many separations were effected by the use of delicately-adjusted air-currents. Variations in line-shaft speed became greatly exaggerated when dealing with fans driven from them at high speeds. A considerable saving in space was made by the abolition of boiler house, economiser, house and chimney stack.